A STUDY ON SURGEON PERFORMING BEDSIDE ULTRASONOGRAM IN ACUTE APPENDICITIS WITH HISTOPATHOLOGIGAL CORRELATION

Dissertation
Submitted in partial fulfilment of the regulations of

M.S. DEGREE EXAMINATION

BRANCH I GENERAL SURGERY

Department of General Surgery

GOVT. STANLEY MEDICAL COLLEGE AND HOSPITAL

CHENNAI - 600001

THE TAMILNADU DR.M.G.R MEDICAL UNIVERSITY

CHENNAI

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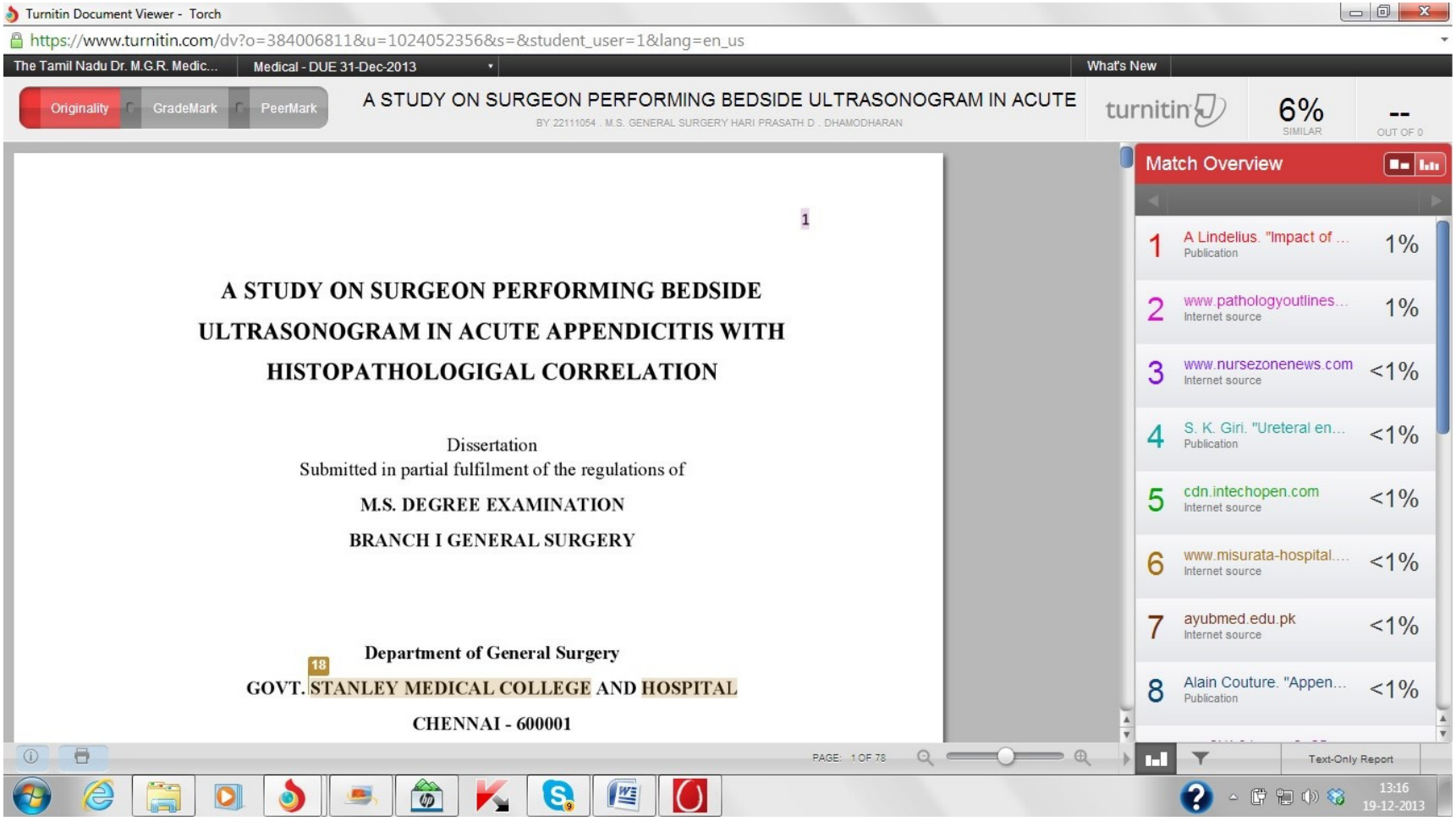
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Is the bonafide work done by **Dr. HARIPRASATH. D,** Post Graduate student (2011 – 2014) in the Department of General Surgery, Government Stanley Medical College and Hospital, Chennai under my direct guidance and supervision, in partial fulfilment of the regulations of The Tamil Nadu Dr. M.G.R Medical University, Chennai for the award of M.S., Degree (General Surgery) Branch - I, Examination to be held in April 2014.

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DECLARATION

I, **DR. D. HARIPRASATH** solemnly declare that this dissertation titled "**A STUDY ON SURGEON PERFORMING BEDSIDE ULTRASONOGRAM IN ACUTE APPENDICITIS WITH HISTOPATHOLOGICAL CORRELATION**" is a bonafide work done by me in the Department of General Surgery, Government Stanley Medical College and Hospital, Chennai under the guidance and supervision of my unit chief.

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This dissertation is submitted to The Tamilnadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the university regulations for the award of M.S., Degree (General Surgery) Branch - I, Examination to be held in April 2014.

Dr. D. HARIPRASATH

Place: Chennai.
Date: December 2013.

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I am extremely thankful to my patients who consented and participated to make this study possible.

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A STUDY ON SURGEON PERFOMING BEDSIDE ULTRASONOGRAM IN ACUTE APPENDICITIS WITH HISTOPATHOLOGICAL CORRELATION

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KEYWORDS: appendicitis, ultrasonogram, radiology, histopathology

ABSTRACT

INTRODUCTION: Diagnosing appendicitis is primarily a clinical evaluation. This would lead to increased negativity on histopathological examination. Diagnosing appendicitis may require adjuvant studies such as computed tomography or ultrasound. Combining clinical evaluation with surgeon performed ultrasonogram may increase diagnostic accuracy, reduce time delay, reduces complications and decrease radiation & costs.

METHODS: A prospective study was conducted with a diagnosis of acute appendicitis. A surgeon performed a clinical examination and ultrasonogram to make the diagnosis. Final diagnosis was confirmed by histopathological examination (Gold standard). Results were grouped and tabulated. The Sensitivity, Specificity, Predictive value & Accuracy of surgeon performing ultrasound were analysed. As ultrasonogram was performed by Radiologist, we compared Surgeon performed ultrasonogram with radiologist in cohort of patients. Analysis was performed by kappa value and fisher exact test.

RESULTS: One hundred and twelve patients were evaluated. Eighty six patients had appendicitis (76.8%). The negative appendectomy rate by clinical examination was 23.2%. The accuracy of surgeon was 92% & yielded sensitivity & specificity as 94% & 81.4%. Radiologist performed ultrasonogram on 35 patients yielded an accuracy of 85.7%. Surgeon performed ultrasonogram on those 35 patients yielded an accuracy of 82.8%. The argument between surgeon and radiologist was good (kappa value- 0.778) implying the surgeon is effective and reliable as radiologists.

CONCLUSION: Accuracy of surgeon performing ultrasonogram was similar with of radiologist performed. Further, when surgeon performs both clinical examination and ultrasonogram a high level of accuracy can be achieved. Based on our study with these high degree of accuracy, surgeon performed bedside ultrasonogram can be used as a primary diagnostic tool in initial evaluation of patient along with clinical examination in cases of acute appendicitis.

INTRODUCTION:

Appendicitis is the inflammation of appendix. It is the most common surgical emergency. The diagnosis involves thorough history and physical examination which is highly reliable. Other studies are not carried out routinely due to time delay. Time delay will lead on to increased morbidity due to complication of disease. These had led to negative appendectomy rate of up to 20% -reported in literature. This rate of negative appendectomy is considered acceptable as it avoids the complication of disease – (perforation / abscess formation) as it increase morbidity of the disease.

In recent days, the imaging studies were used in addition to clinical examination. Ultrasonography/ computerized tomography with its improved quality have led to state of liberal use of the radiological study in appendicitis to improve the accuracy of diagnosing the disease.

More recently, the computerized tomography`s routine use in diagnosing appendicitis questioned. The reason is inefficiency& ionizing radiation exposure especially in children. So many groups recently have implemented clinical evaluation along with ultrasonogram of appendicitis primary diagnostic imaging modality. The ultrasonogram is used as (additive/primary) diagnostic modality due to its cost

effectiveness and lack of radiation exposure– easy to perform. Ultrasonogram studies have its own disadvantage of being operator dependent. It is carried out by department of radiology.

The use of surgeon performed ultrasonogram in many conditions has been well documented in literature. The documented role is in thyroid, emergency trauma, vascular surgery, breast and endocrine. Many articles were published supporting these. In our department of general surgery, we had training in department of radiology for basics in ultrasonography and other imaging studies for a period of one month. This experience made us to perform and study accuracy of the bedside ultrasonogram by surgeons in appendicitis.

The technique used is graded compression. A high frequency ultrasound transducer is used to give pressure over RIF. This technique displaces compressible intestinal loops. The intestinal loops are filled with gas are easily compressible. Appendix in normal circumstances is always not visualised. Inflammation of the wall makes then rigid. It is non compressible. It is located in caecum as a blind ending structure. Being part of intestine, it appears with laminated wall. It is characteristically aperistaltic. The diameter is diagnostic and if greater than 6mm is feature of appendicitis. Appendicolith are formed of calcium salts as nidus. This signifies appearance of foci with posterior shadowing. The

inflammation initiated is also seen over fat around appendix/ mesoappendix. They are seen as echogenic foci. These features of Appendicolith and periappendiceal fat are contributory to diagnosis.

Because of the location of appendix in right iliac fossa, our examination is focussed on right lower quadrant. Ultrasonogram has high degree of safety and shows higher accuracy. The technique of performing and interpreting findings is easier, reliable. The accuracy in diagnosing appendicitis is around 90%. If performed by experienced hands time consumed is very less. When compared with other imaging studies the risk of radiation is lacking. It is cost effective compared with computerised tomography.

AIM:

The aim of our study is to assess accuracy of surgeon performing bedside ultrasonogram in diagnosing acute appendicitis in our population group.

Acute appendicitis is diagnosed on clinical background with history and physical examination. Imaging studies were carried out in order to 4reduce negative rate of surgery.

Computerised tomography and ultrasonogram were commonly performed. Ultrasonography is portable and can be performed at bedside. By combining clinical evaluation and surgeon performing ultrasonogram diagnostic accuracy is increased.

DISCUSSION:

Appendix is a derivative of midgut along with ileum and ascending colon located as intra abdominal structure.

The inflammation of vermiform appendix due to elaboration of microbial flora is described as acute appendicitis.

Acute appendicitis is the common surgical problem encountered in surgical emergency department.

Acute appendicitis occurs in wide range of age groups being less common age less than two years of age and occurs in all age groups. The peak incidence is 10 – 30 years of age. Being the most common surgical emergency, early surgical intervention improves outcome.

Appendicular diagnosis is elusive and a high index of suspicion is important in preventing complications & morbidity of disease. Appendicular perforation accounts for leading general surgical cause of death worldwide.

Luminal obstruction accounts for major cause of acute appendicitis. This is caused by stool inspissations within lumen (faecolith / Appendicolith), foreign body (seeds/ vegetable matter), lymphoid hyperplasia, parasites and finally neoplasm of appendix.

EMBROLOGY OF APPENDIX:

The midgut derivatives of gastrointestinal tract are appendix, ileum and ascending colon. Around eight week of gestation appendix appears as an out pouching from caecum and makes rotation of 270 degree along with the gut to a medial location. It occupies the right iliac fossa region of the abdomen.

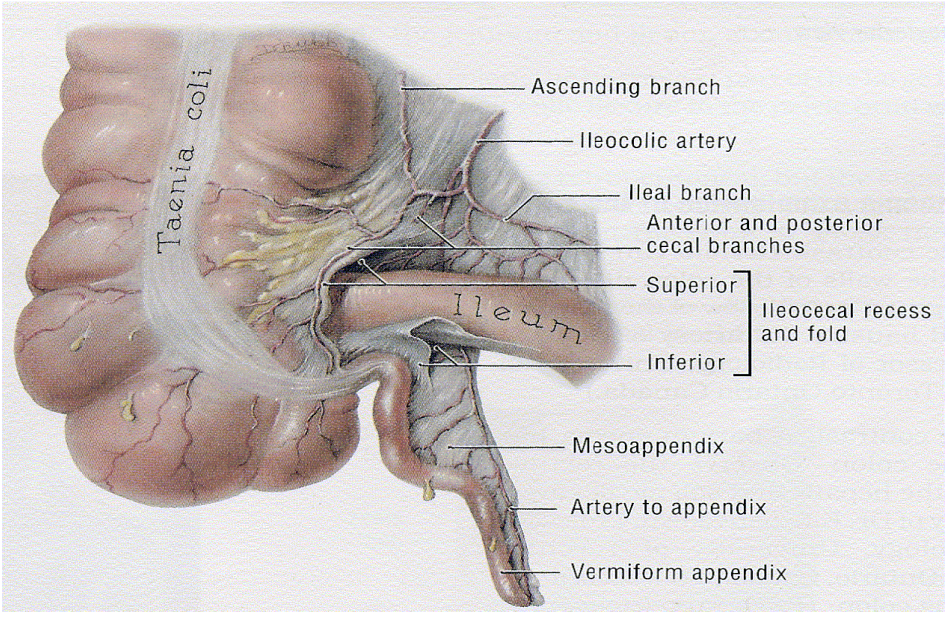
ANATOMY:

The appendix is supplied by appendicular artery.

Histology reveals mucus producing goblet cells scattered in mucosa.

The sub mucosa contains lymphoid follicles.

The length varies from 2-20cm. Average being 9cm.



LOCATION:

The tip of appendix varies in position while base lies at the convergence of taenia at inferior part of caecum.

Appendix/caecum relationship:

Base of appendix is at convergence of taenia-constant.

Tip varies from

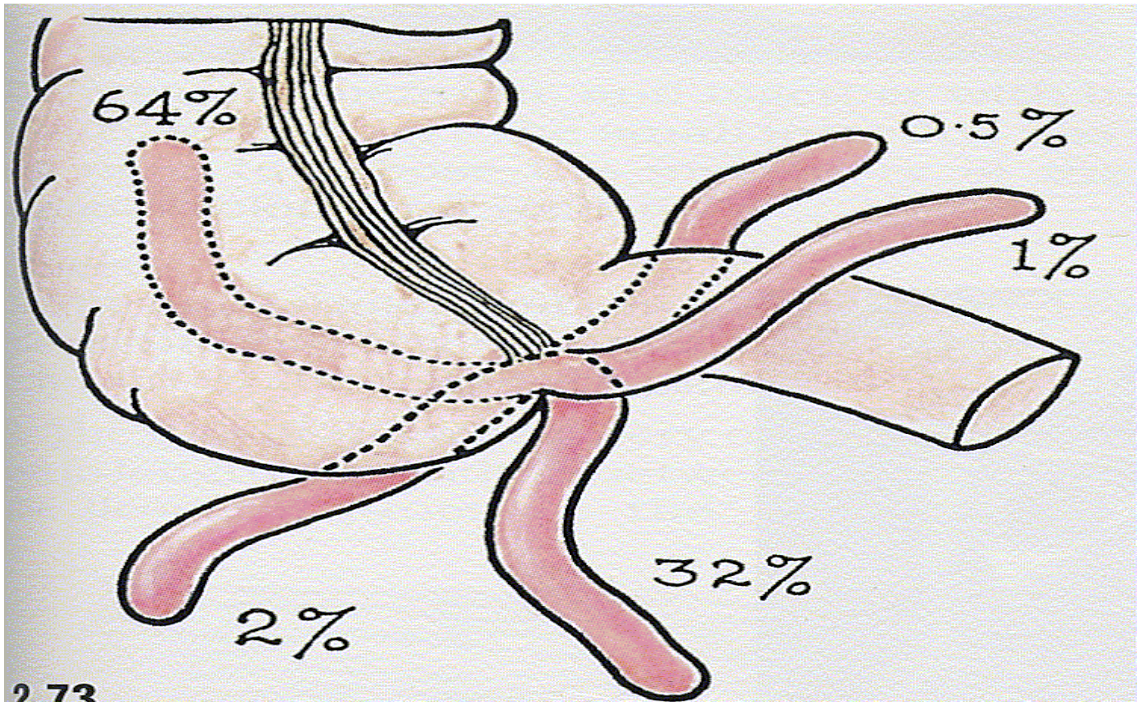
1- retrocecal - most common location

2- pelvic - 30 %

3- subcecal

4- peri-ileal

5- right pericolic position



HISTORY:

Reginald Fitz coined the term appendicitis in 1886.

Survival of patient after removing a perforated appendix was first reported by **Richard hall.**

Chester Mcburney first described migratory pain and localisation of pain along the right spinoumblical line in 1889. In 1894 he described muscle splitting incision for surgery.

Kurtsemm first reported laparoscopic appendectomy in 1982.

Transvaginal and single incision laparoscopic surgery are minimal invasive approaches not widely adopted.

Historical background of appendix dates back to 16^{th} century

- Greek scholar Erasmus (1530) was the first to record a case of appendicitis with abscess formation.
- Andreas Vesalius (1543) illustrated the normal appendix in his "De Humani Corporis Fabrica".
- The earliest description of a presumed case of perforated appendix was by French physician Jean Fernal (1554) after an

autopsy on a 7 years old girl with diarrhoea and was given a large quince to stop her bowels.

- Verneys (1710) was the first to coin the term 'Appendix Vermiformis'.
- Giova Morgagni (1710) illustrated appendix in his "Adversian Anatomical".
- In 1719, Lorenz Heister, Professor of surgery at Helmstedt recognized that appendix might be the site of acute primary inflammation.
- Leonardo da Vinci was the first to describe and illustrate the appendix in 1742. He called it "orecchio" literally means ear to denote the auricular appendage of the caecum.
- John Parkinson in 1812 recorded a proven case of acute appendicitis. A 5 year boy died after 48 hours after onset of acute abdominal pain and vomiting. At autopsy, an acutely inflamed appendix that contained a faecolith was found. He stated that no disease was present in the caecum or proximal appendix, except for the tip of the appendix.
- Fredrick Treves in 1890 advocated conservative management of acute appendicitis by appendectomy after infection subsided.

- In 1880 Lawson Tait, a pioneer of abdominal surgery performed first transabdominal appendectomy on a girl with gangrenous appendicitis.
- In 1902 Albert Oschner, surgeon from Chicago recommended a conservative management approach to patients with generalised peritonitis following Appendicular perforation to allow surgical intervention at a later date.

ETIOLOGY & PATHOGENESIS:

The pathogenesis is initiated by luminal obstruction. Luminal obstruction accounts for major cause of acute appendicitis. This is caused by stool inspissations within lumen (faecolith / Appendicolith), foreign body (seeds/ vegetable matter), and lymphoid hyperplasia.

Some parasites like ascariasis, strongyloides also contribute.

Neoplastic causes -primary, metastatic & carcinoid.

Lymphoid hyperplasia is more common in children and young adults, accounting for the increased incidence of appendicitis in these age groups.

Luminal obstruction.

- Lymphoid hyperplasia - 60%

- Faecolith 35%.
- Inspissated barium.
- Fruit seeds.
- Worms.
- Extra-luminal obstruction - Ca Caecum

Raised intra-luminal pressure

- Mucus accumulation
- Multiplication of bacteria.
- Venous and lymphoid congestion and impaired arterial flow, thrombosis and gangrene.
- Perforation may occur through devitalized tissue.

Common bacterial growth encountered include

- e.coli - 77%
- bactroides fragilis - 80%
- bactroides thetaiotaomicron – 61%
- peptostreptococcus - 46%
- pseudomonas - 18%
- streptococcus viridians - 43%
- group d streptococcus - 27%
- Bilophila wadsworthia - 55%.

The flora is similar to that encountered in colonic lumen with various anaerobic & aerobic bacteria. Above mentioned flora has been encountered in perforated appendicecal patients who have been well established. In non perforated cases, cultures of peritoneal fluid does not yield positive finding.

Obstruction of lumen contributes to overgrowth of bacteria, results in continuous mucosal secretions which lead to intraluminal distension and increased wall pressure. This produces a visceral pain sensation in periumblical region. There is subsequent impairment of venous and lymphatic drainage which ultimately lead on to mucosal ischemia-localised inflammatory process –gangrene – perforation of lumen.

Appendicecal perforation occurs at least 48 hours after symptom onset. It is accompanied by an abscess cavity which is walled off by small intestine and omentum .rarely these can lead onto generalised peritonitis, septic shock which develops into multiple intra peritoneal abscesses.

CLINICAL FEATURES:

Appendicular pathology is usually diagnosed with history & physical examination of patients in most of the cases.

Acute appendicitis should be always the first diagnosis in acute abdominal pain in order to prevent complication of disease which could be easily diagnosed. It is most common cause of acute abdominal pain worldwide.

Symptoms and signs could elicit with prompt history and examination.

SYMPTOMS:

- The typical history is onset of generalized abdominal pain followed by anorexia and nausea.
- In 70 % of patients the pain arises in an epigastric area – it is an epigastric phase of acute appendicitis. In 2-4 hours it migrates to the area of appendix (the Kocher's sign).
- Abdominal pain: occurs in right lower quadrant – right iliac fossa. The pain as a classical feature of origin from periumblical region with discomfort then tracks down and localized to right iliac fossa.

The characteristic of pain is sharp and intense which is due to irritation of parietal peritoneum. Initial periumblical location signifies visceral pain.

- The characteristic localization of pain is not seen in all cases .it is difficult in cases of elderly & children who has atypical presentation.
- Fever – low grade initially.
- Vomiting may occur during this time.
- Anorexia – decreased appetite which is more indicative in children as a characteristic finding.
- Localization of pain right lower quadrant manifest as the somatic component.
- Somatic pain depends on the location of the tip of the appendix.
- This can be referred as follows ,

Left lower quadrant → Left lower quadrant pain

Retrocecal → flank or back pain

Pelvic → suprapubic pain

Retroileal → testicular pain.

CLINICAL EXAMINATION:

- The temperature is often mildly elevated and usually rises to higher levels in the event of perforation, although this is highly variable.

  Temperature usually less than 38*c but increases when perforation and other complications sets in.

- Tachycardia – pulse greater than 100/minute may often elicited.

- Examination reveals Right lower quadrant tenderness. It denotes muscle spam due to peritoneal irritation. The intensity increases to rebound tenderness.

The cardinal features include

- Low-grade pyrexia
- Localized abdominal tenderness
- Muscle guarding
- Rebound tenderness.

Typical history of migratory pain is shown by patient**- pointing sign.**

Mc Burney's point is surface landmark in appendix. Tenderness elicited at this point is classical finding. It is the point of maximal tenderness. This is elicited while examining from lif to Rif.

- Rebound tenderness is elicited at point of maximum tenderness. It is by applying gentle pressure. Also done by asking them to cough.
- Cutaneous hyperesthesia in T10, T11, T12 dermatome.
- Tender Appendicular mass

The following signs may be present in a minor group of patients: they denote peritoneal inflammation

- Rovsing sign – right iliac fossa pain with palpation of the left iliac fossa.
- Obturator sign- it is elicited by stretching obturator internus. It is done by internal rotation of flexed hip. Tenderness on this position signifies location in deep pelvis.
- Psoas sign – if appendix along right psoas, stretching of it elicits tenderness.
- Dunphy sign –sharp pain on right iliac fossa while attempting voluntary cough.
- Right iliac fossa pain on percussion of a remote quadrant of the abdomen. It is also elicited on deep percussion of the patient's heel.
- These mentioned signs could also be elicited in atypical cases and could aid in diagnosis of appendicitis.

CLASSIFICATION:

The classification of acute appendicitis include

1. Appendiceal colic.

2. Simple superficial appendicitis.

3. Destructive appendicitis:

    a) Phlegmonous;

    b) Gangrenous;

    c) Perforated.

4. Complicated appendicitis:

    a) Appendicular infiltrate;

    b) Appendicular abscess;

    c) Diffuse purulent peritonitis.

5. Other complications of acute appendicitis

(Pylephlebitis, sepsis, retroperitoneal phlegmon, local abscesses of abdominal cavity).

Laboratory investigations:

The laboratory investigations mentioned here are not specific for diagnosing appendicitis but they may aid in diagnosis in equivocal and atypical presentations;

- WBC- greater than 10,500 cells/ µL: 80-85% of adults.

  Neutrophilia- greater than 75-78%.

- CRP (C-reactive protein - >1 mg / dl are common.

  Very high levels signifies complication (gangrenous evolution change) when associated along with leucocytosis and neutrophilia.

- Urine routine :

  It differentiates from urinary tract conditions.

- Urinary beta-hcg:

  It differentiates appendicitis from early ectopic pregnancy in women of childbearing age.

- Urinary 5-hydroxyindole acetic acid (5-HIAA)

  It shows increased values in acute appendicitis. Decrease in level indicates perforation. So monitoring would aid.

IMAGING STUDIES:

1) Plain x-ray abdomen:

- Non specific abnormal gas pattern
- Fecalith if present is highly suggestive of diagnosis.

2) Ultrasonography:

- Ultrasonography of abdomen is a safer and used as a primary tool for diagnosing appendicitis.
- Ultrasonogram has high specificity which would aid in confirming the diagnosis.
- Advantage being cost-effectiveness & no risk of radiation.

3) Computerised tomography -abdomen

- With oral and rectal contrast.
- Features include dilatation, wall thickening, thick mesoappendix, and arrow head sign- irregular filling defect on inflamed base arising from contrast filled caecum.
- Exposure to radiation and cost is of concern.
- Low-dose abdominal CT may be preferable for paediatric populations and young adults.

4) Magnetic resonance imaging:

Useful in pregnant patients who are inconclusive in ultrasonography.

HISTOLOGY:

The structure of vermiform appendix resembles that of the colon with appearance of gut wall includes four layers-

1) Mucous membrane – epithelium,
   Lamina propria,
   muscularis mucosa
2) Sub mucosa- loose areolar tissue
3) Muscularis externa
4) Serosal / adventitial layer

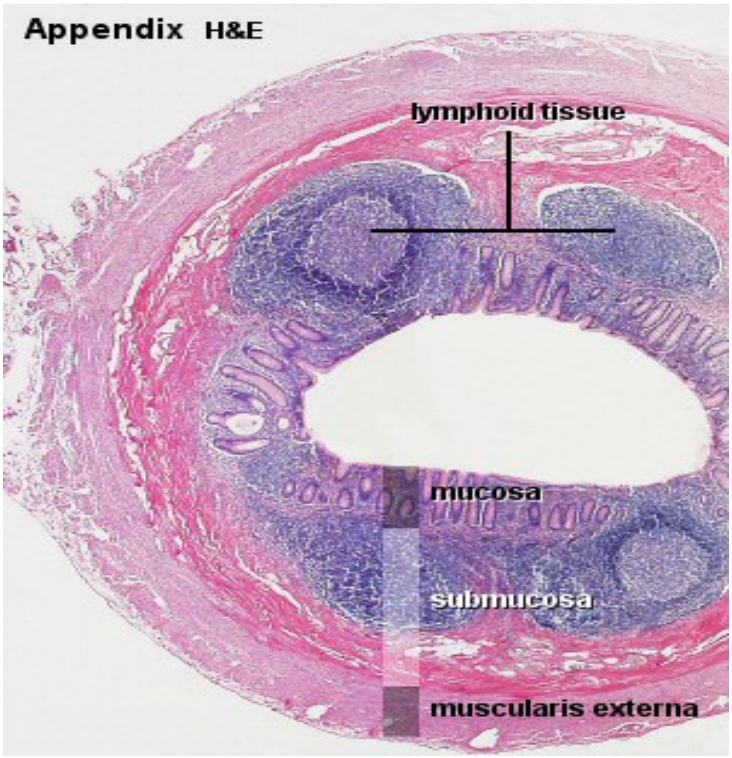
The features of appendix differs from colon in following ways

1) It is the narrowest part of gut
2) The crypts are poorly formed
3) The longitudinal muscle coat is complete and equally thick all around. There is absence of taenia coli.
4) The sub mucosa contains abundant lymphoid tissue which may completely fill it.

The lymphoid tissue is not present at birth.

It gradually increases and is best seen in children about 10 years of age.

Thereafter, progressive decrease in quantity of lymphoid tissue occurs.



HISTOLOGY PICTURE SHOWING FEATURES OF NORMAL APPENDIX.

IN ACUTE APPENDICITIS,

The macroscopic picture appears by

● Presence of Fibrino-purulent exudates on wall of serosa with prominent vessels

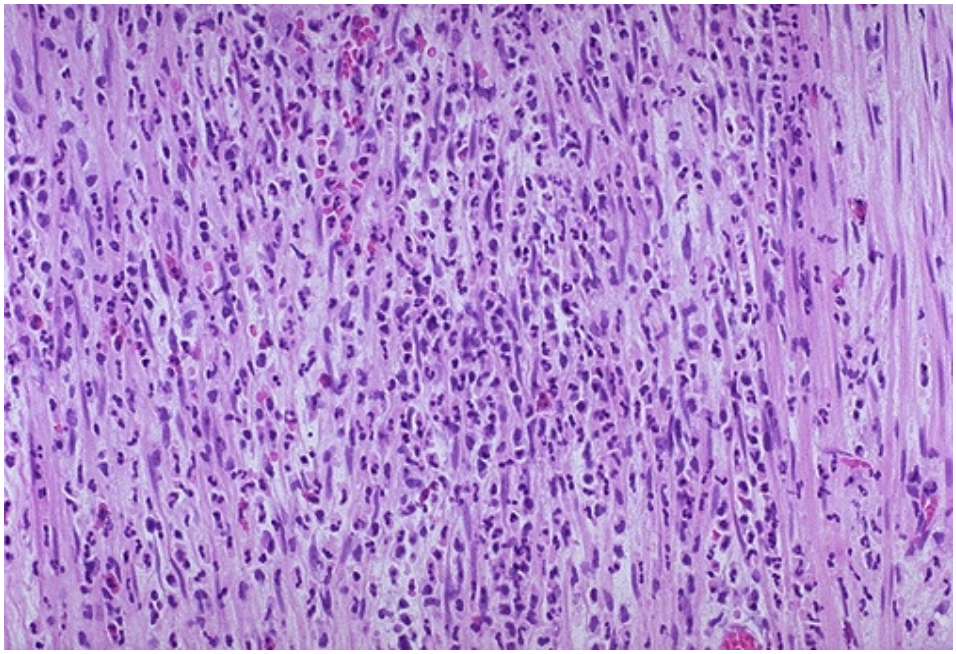
● The Appendicular lumen may contain blood-tinged pus

● other features may include variable perforation, presence of mucosal

ulceration, Fecalith or any other obstructing agent like foreign body ,seeds , gall stones ,parasites .

The picture illustrates variable range of inflammatory response.

The microscopic picture depicts,



Histology shows neutrophilic infiltrate in muscularis propria

● Presence of ulceration in mucosal layer.

● In early stages of inflammatory response – presence of minimal to dense neutrophils in muscularis propria with necrosis, congestion,

perivascular neutrophilic infiltrate

● In Late stages: microscopically there is absent mucosa, necrotic wall, prominent fibrosis, granulation tissue, marked chronic inflammatory infiltrate in wall, thrombosed vessels.

These demonstrate histopathology of acute appendicitis.

DIAGNOSIS:

Appendicitis should be considered in the differential diagnosis of almost all patients with abdominal pain, but there are other problems that are most frequently confused with appendicitis and should be excluded.

The large majority of these problems can be excluded on the basis of a thorough history and physical examination and limited laboratory tests.

The diagnosis of acute appendicitis is essentially clinical.

However, a decision to operate based on clinical suspicion alone can lead to the removal of a normal appendix in 15–30% of cases.

The premise that it is better to remove a normal appendix than to delay diagnosis does not stand up to close scrutiny, particularly in the elderly.

The scoring system is developed in order to diagnose. They include clinical history, signs and laboratory investigations.

The commonly recommended scoring system which is being used is Alvarado score. In these, scoring system value or scores are given in 1 and 2.

More values are given for right lower quadrant pain and leucocytosis. Others are assigned a value of 1.

ALVARADO SCORING SYSTEM (MANTRELS)

Symptoms	**- Score**
Migratory Right iliac fossa pain	- 1
Nausea and vomiting	- 1
Anorexia – acetone	- 1
Signs	**- score**
Right iliac fossa Tenderness	- 2
Rebound tenderness	- 1
Elevated temperature (>37.3*c)	- 1
Laboratory investigations	
Leucocytosis (>10.0 * 10^9/L)	- 2
Shift to left (WBC count) > 75%	- 1

Total score of 10.

MANTRELS-Migration of pain, Anorexia, Nausea or vomiting, Tenderness, Rebound pain, Elevation of temperature, Leucocytosis, Shift to left (segmented neutrophils).

Interpretation of score

- 9-10: almost certain appendicitis.
- 7-8: high likelihood of appendicitis, imaging study.
- 5-6: compatible but not diagnostic.
- 0-4: extremely unlikely.

In equivocal cases, imaging studies aid in diagnosis. Imaging studies include ultrasonogram or computerized tomography scans.

Abdominal ultrasound examination is more useful in children and thin adults.

In female with suspected gynecological pathology ultrasonogram is used. It has the diagnostic accuracy in excess of 90%.

Contrast-enhanced CT scan is most useful in elderly due to diagnostic uncertainty. The differential diagnosis includes acute diverticulitis, intestinal obstruction and neoplasm.

The use and selection of appropriate imaging study may be cost-effective.

It reduces both the negative appendectomy rate and the length of hospital stay due to complication of the disease process which develops due to delay in diagnosis.

DIFFERENTIAL DIAGNOSIS:

Acute mesenteric adenitis:

Acute mesenteric lymphadenitis is more common in pediatric population.

There is current or recent history of upper respiratory infection.

Generalized lymphadenopathy may be evident.

Tenderness is not sharply localized.

Relative lymphocytosis may be present. It is a self-limiting disease.

Acute gastroenteritis:

It is a childhood disease.

Usually presents with profuse watery diarrhea associated with nausea and vomiting. Cramping pain is associated feature.

Male urogenital system:

In male urogenital system the differential diagnosis include,

Testicular torsion,

Acute epididymitis,

Seminal vesiculitis.

Meckel's diverticulitis:

It is remnant of vitello-intestinal duct present in 2% of population.

Inflammation of the structure produces acute abdominal pain which could be identified by imaging study.

Intussusception:

Commonly occur in children younger than 2 Years of age.

They present as an acute abdomen with pain around the umbilicus.

The pain is sudden lasting for variable time in colicky character.

Typical history of red- currant jelly stools is present.

Examination revealed a sausage shaped mass in Right lower quadrant.

Ultrasonogram is diagnostic investigation of choice.

Barium enema could be diagnostic - if there are no signs of peritonitis.

Crohns enteritis:

More common in middle age & elderly. It is difficult to differentiate clinically. Diagnosis may be made intraoperatively.

Perforated PU:

It is due the fact that when the spilled contents gravitate down the right gutter with spontaneous sealing of perforation.

Patient presents with maximum tenderness in right lower quadrant. By proper history and imaging study this could be diagnosed.

Colonic lesion:

Diverticulitis or perforating cecal cancer is the common colonic pathology which occurs in elderly. Patient may present with intestinal obstruction. Contrast enhanced computerised tomography is the investigation of choice.

Epiploic appendagitis:

It is the infarction of the intestinal appendage secondary to torsion.

Urinary tract pathology:

Right acute pyelonephritis:

It is usually associated with fever & chills, renal angle tenderness.

Pyuria and bacteruria may also be present.

Ureteral stone:

Referred pain down to the genitalia and hematuria.

Cystitis:

Presence of fever with chills and supra pubic tenderness.

Primary peritonitis:

Here history of liver or renal disease is present. It is diagnosed by peritoneal aspiration usually contains gram positive bacteria.

Presence of Flora, G-ve rods suggests secondary peritonitis.

Henoch schonlein purpura:

In children usually presents 2-3 weeks after streptococcal infection of upper airway tract.

There is history of fever, Joint pain & purpura.

Yersiniosis:

It occurs by fecal oral transmission.

Presents with mesenteric adenitis, ileitis, colitis, and acute appendicitis

Majority are mild and self-limited.

In women of reproductive age group were diagnosis is variable, differential diagnosis include,

Pelvic inflammatory disease:

Especially if confined to Right fallopian tube.presents with purulent vaginal discharge. Examination reveals cervical motion tenderness. Ultrasonogram would aid in diagnosis.

Ruptured Grafian follicle:

It occurs during menstrual cycle.

Patient presents with history of brief mild, diffuse lower abdominal pain and has tenderness.

Time of occurrence at Midpoint of menstrual cycle (Mittelschmerz).

Ruptured ectopic pregnancy:

Patient has the history of delayed / missed menstrual cycle.

History of abdominal pain with vaginal bleeding is present.

Examination reveals a mass in lower abdomen arising from pelvis with high value of hcg & low hemotocrit. Presence of adnexal tenderness.

Ultrasonogram will confirm the diagnosis. Emergency surgery is warranted.

Twisted ovarian cyst:

Patient on abdominal & vaginal exam may reveal pelvic mass.

Investigations – Abdominal & Transvaginal ultrasonogram with color Doppler study. Pain abdomen is due to impaired vascularity leading on to venous congestion resulting in ischemia.

Torsion of ovarian cyst needs emergent operative intervention while rupture can be managed conservatively.

This differential diagnosis should be considered in cases of acute abdominal pain. By elaborate history and clinical examination, one can arrive at a conclusion and avoids unadervent investigations. By selective use of imaging studies, diagnosis can be narrowed.

TREATMENT:

Treatment includes medical (conservative) and surgical management. In most cases, surgery is the treatment of choice. Conservative treatment is carried out in Appendicular mass.

Surgical options include,

1) Appendectomy – open/laparoscopy

2) Drainage – in case of localised abscess.

Medical management include broad spectrum antibiotics, hydration. It also includes monitoring vitals, temperature, and output.

COMPLICATIONS:

The complications occurs due to delay in diagnosis or misdiagnosis which may lead on to

1) Appendicular perforation

2) Appendicular abscess.

Appendicular rupture is seen in overall rate of 25% of appendicitis. The age commonly encountered are <5 and >65 years. It is suspected with high grade fever & leucocytosis .Most of the cases is locally contained. These leads to generalised peritonitis when walling effect becomes ineffective.

Appendicular abscess accounts for 2 -5 % of cases. They usually present as a palpable lower quadrant mass in Rif. Phlegmon represents the matted loops of bowel surrounding inflamed appendix.

The complications of acute appendicitis accounts for increased morbidity and mortality. The mortality ranges from 0.2 – 1 %.

By timely diagnosis and intervention, complication could be reduced.

RADIOLOGICAL LITERATURE:

Appendicitis is the most common cause for acute abdominal presentation in emergency department. Acute appendicitis typically diagnosed by clinical evaluation. The patients with typical presentation usually have an appendectomy done before preoperative imaging is done. This may be complicated if a normal appendix is removed in a patient with symptoms due to other causes.

On the other hand in patients with atypical presentation, surgery may be delayed which may result in Appendicular perforation associated with abscess formation making appendectomy a difficult procedure.

According to a clinical literature, normal appendix is removed in about 15 to 47% of patients and in about 35% perforation results. It is the balance between this negative laparotomy and perforation rate that motivates the use of cross sectional imaging in patients with right lower quadrant pain.

The use of imaging in this patient is to identify the patients with acute appendicitis and those without acute appendicitis and in order to find the other causes of right lower quadrant pain.

The variety of mentioned conditions would mimic acute appendicitis are acute typhilitis, acute mesenteric lymphadenitis, acute segmental

infarction of the omentum, variation of the crohnsdisease, acute diverticulitis and gynaecological causes in women. At the same time, appendicitis may mimic pelvic inflammatory disease.

Appendix usually located caudal to the base of the caecum, but it has a variable location mentioned to be in retrocaecal, retroileal. In sub percentage of people, it may be located in the true pelvis where they mimic pelvic inflammatory disease in women.

In a retrospective study done in about 462 patients with suspected appendicitis the rate of negative appendectomy was significantly lower in women who performed pre operative imaging than in who does not. But this rate was not significant in girls, boys and men.

Both computerised tomography and ultrasound of abdomen provide accurate and sensitive diagnosis of patient expertise. In some cases, ultrasound is reserved for patients with thin abdomen and ct scans for larger patients.

These considerations recommend the use of preoperative ultra sound in all women with right lower quadrant pain. The trans-vaginal ultrasound is used in whom a diagnosis could not be made with routine suprapubic ultrasound.

In diagnostic ultrasound, the transducer converts one form of energy into another. The transducer serves two functions

1) Conversion of electric energy from transmitter into acoustic pulses towards the patient

2) Reception of reflected echoes and converting into electric signals

Transducer uses piezoelectricity discovered by Pierre and curie.

Piezoelectric crystals respond to electric field by changing its shape and on compression they generate electric potential.

Piezoelectric effect results when the reflected echoes strike the transducer creating electric potential.

The change in polarity and voltage changes provides the information to generate ultrasound image.

Fig: ultrasonic transducer

The pathophysiology of acute appendicitis involves the obstruction of the appendicular lumen and in about 35% of the patients with faecolith. This cause continuous mucus secretion and distension of the lumen which results in venous congestion, hypoxia and mucus ulceration. This may subsequently result in bacterial infection which causes gangrene and perforation in most of the cases resulting in walled of perforation than contamination of the peritoneal cavity. Finally phlegmon formation.

APPENDIX AS A NON COMPRESSIBLE TUBULAR STRUCTURE

In Acute appendicitis,

The ultrasonographic diagnosis include,

Identify appendix as a,

- Blind ended
- Aperistaltic
- Non compressible
- Gut signature – laminated wall
- Arising from the base of the caecum
- Diameter greater than 6mm

Figure2: APPENDICOLITH

Supportive features

- Inflamed peri-enteric fat
- Pericaecal collection
- Appendicolith

Figure 3: inflamed appendix as a blinded structure

IN LITERATURE, in 1986 puyalaert made a study on the use of graded compressive sonography in 60 consecutive cases suspected of having acute appendicitis.

After that, other investigators improved the sonographic criteria for diagnosing appendicitis establishing the value of sonography in case with equivocal evidences.

This has significantly reduced the rate of negative appendectomy than the cases diagnosed by instinct.

Initially puyalaert established the sonographic diagnosis of acute appendicitis by visualisation of the abnormal appendix which is a blind ended, non compressible, aperistaltic structure with a gut signature.

Later other investigators visualised normal appendix which is a compressible structure with a thickness of about 3mm. Size can be used to differentiate a normal appendix from the abnormal one.

The threshold level above which the diagnosis of the acute appendicitis found to be highly likely has been set at above 6mm or 7mm. Sonographic visualisation of the Appendicolith regardless of the appendicular diameter should be considered as a positive test.

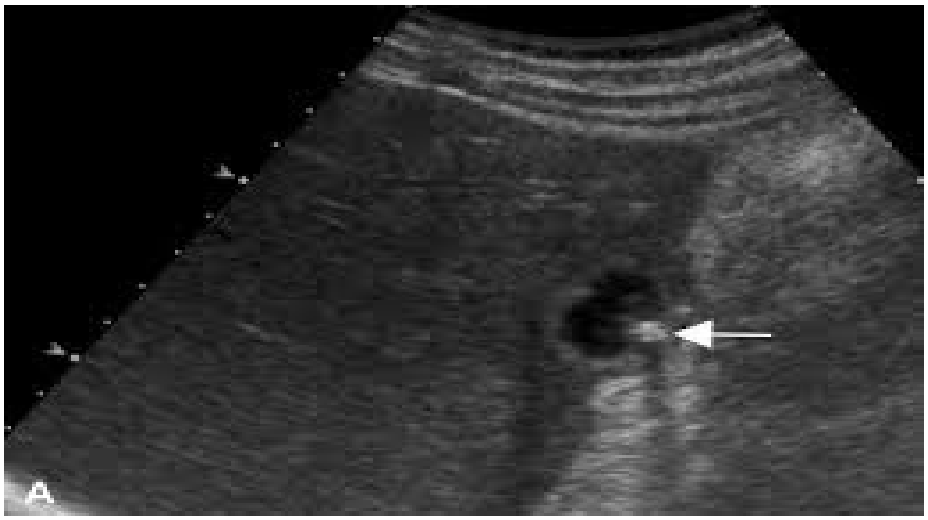


Figure 4: APPENDICOLITH

A rounded or partly rounded appendix has a more significant relation with acute appendicitis than an ovoid appendix. The colour Doppler study also useful, showing hyperaemia in inflamed appendix.

Lee et al established the use of graded compression sonography with an adjuvant posterior manual compression technique in the diagnosis of acute appendicitis. In a study, 85% of the patients with suspected appendicitis were diagnosed with graded compression sonography and additional 10% increase was achieved with the use of posterior manual compression technique.

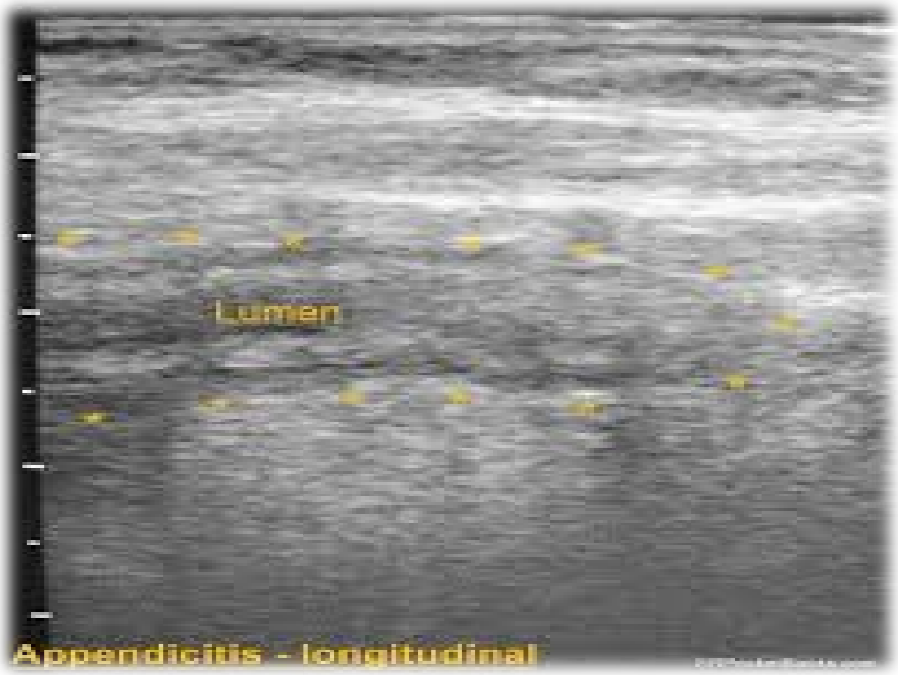


Figure demonstrates longitudinal axis of sonographic picture showing blind ended tubular structure.

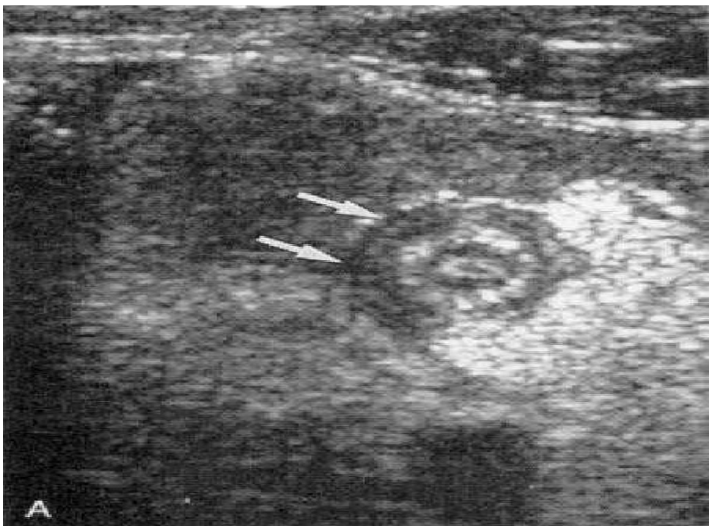


Figure 5: Appendix appear a rounded laminated structure

In a subset of patients appendix may be located in the true pelvis and sonographic diagnosis of appendicitis may be difficult with suprapubic ultrasound. This is mostly encountered in women probably due to capacious pelvis. In these circumstances use of Transvaginal ultrasound may help in establishing the diagnosis of appendicitis as the appendix may be in close relation to the uterus or cervix.

The sonological criteria are the same as for suprapubic ultrasound. But the visualisation of the appendix arising from the base of the caecum may be impossible and compression is not feasible. However, blind ended loop, dilated lumen, increased diameter and inflammation of the surrounding fat can be made out.

If the appendix has ruptured before ultrasound is made, the identification of the pelvic abscess can help in diagnosis of the pelvic inflammatory process.

Although the sensitivity of sonography decreases with perforation the features statistically associated are

Loculated Pericaecal collection,

Phlegmon or abscess,

Prominent Pericaecal or Appendicular fat

Circumferential loss of submucuosal layer of appendix.

The false positive result may occur if normal appendix or thickened ileum is mistaken for inflamed appendix.

Sonographic features of appendicular perforation

- Loculated Pericaecal collection (Phlegmon/Abscess)
- Prominent Pericaecal fat
- Circumferential loss of sub mucus layer of appendix

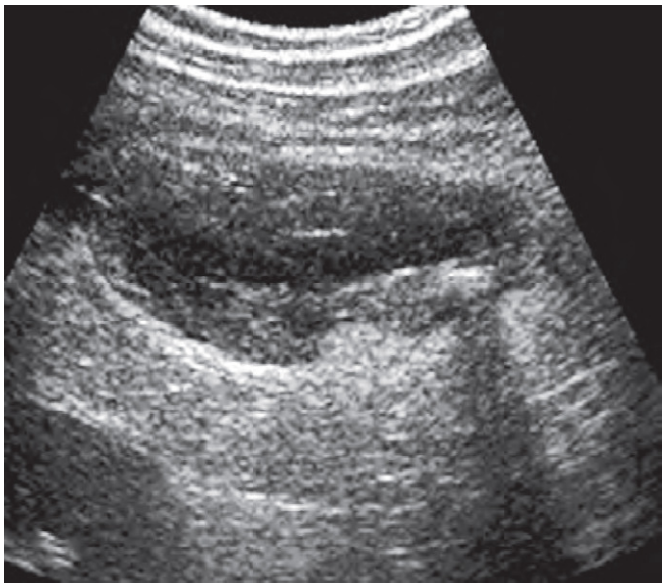
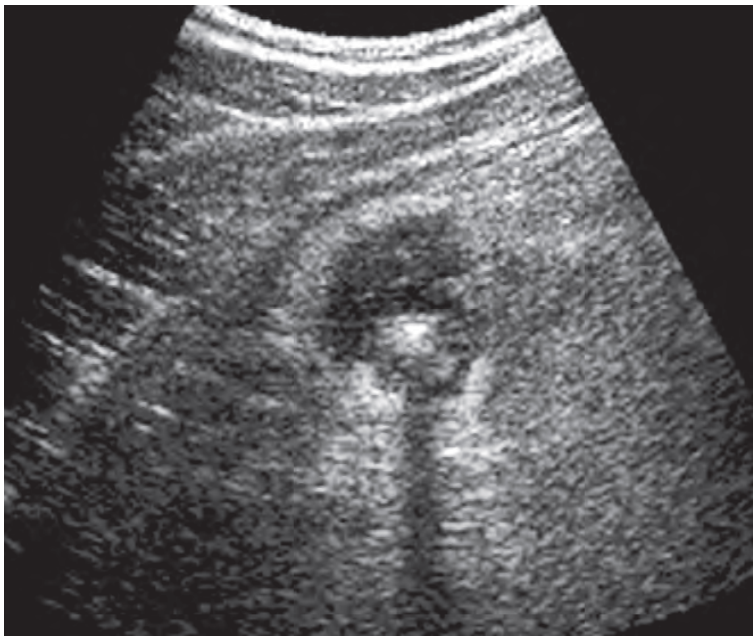


Figure 6&7: APPENDICULAR ABSCESS



Ultrasonographic picture (fig 6-long axis & fig-7 – transverse image) of right lower quadrant shows Appendicular abscess. There is an abscess with escaped Appendicolith with acoustic shadowing.

Clinical misdiagnosis of appendicitis occurs most common in young women with acute pelvic inflammatory disease, Torsion or rupture of ovarian cyst, or postpartum ovarian vein thrombosis. This has established the use of preoperative ultrasound or computerised tomography in all young women suspected of acute appendicitis.

Disease other than pelvic inflammatory disease such as acute mesenteric adenitis, acute typhilitis, acute infarction of omentum, acute diverticulitis, and crohns disease may also mimic the use of acute appendicitis establishing the value of sonography in the preoperative diagnosis of appendicitis.

Materials and methods:

After ethical committee approval, study proceeded as prospective conducted in department of general surgery, Stanley medical college and hospital, Chennai – Tamil nadu.

For time period from APRIL 2013 to NOVEMBER 2013 (8 month period).

These patients who were admitted and evaluated with basic laboratory investigation and diagnosed clinically as a case of acute appendicitis in our emergency department were enrolled in our study.

EXCLUSION CRITERIA:

1. Patient not willing to get the investigations done
2. Pregnant women
3. Patient with clinically diagnosed with other acute abdomen causes

The surgeon performing the ultrasonogram – abdomen, performs the initial evaluation and was blinded to any imaging obtained before surgical consultation. After obtaining consent, he then performs ultrasonogram.

Consent was obtained from the guardian / parents of children < 12 years of age and from the patients appropriately. The clinical history, physical examination of the patient and abdominal ultrasonogram were performed bedside of the patient. The surgeon performed ultrasonogram by 5.5-7.5 MHZ high frequency linear transducer.

The technique used here is by graded compression. A high frequency ultrasound transducer is used to give pressure over Right iliac fossa.

The technique displaces compressible intestinal loops. The intestinal loops are filled with gas are easily compressible.

Appendix in normal circumstances always not visualised. Inflammation of the wall makes them rigid and non compressible.

The diagnostic ultrasonogram finding is

- Non– compressible
- Aperistaltic
- Blind – ended
- Tubular structure
- Laminated wall arising from the base of caecum.
- Diameter should be greater than 6mm.

Other signs of appendicitis are

- Appendicolith
- inflamed perienteric fat
- peri-appendicecal and peri- cecal fluid collection

-the Appendicolith appears as bright echogenic foci with distal acoustic shadowing.

-the above mentioned appearance in ultrasonogram was considered positive in our study.

The results were documented along with clinical examination.

The patients were followed up with intraoperatively findings & histopathological findings which were also documented.

The decision of proceeding to surgery was solely based on clinical examination and other imaging modality performed earlier.

The final diagnosis of appendicitis was confirmed by **gold standard technique of pathological examination.**

PROFORMA

- NAME : SL. NO:
- AGE /SEX:
- ADDRESS WITH CONTACT NUMBER:
- IP NO:
- DATE OF ADMISSION:
- DATE OF SURGERY:

HISTORY OF PRESENTING ILLNESS:

Pain: duration

Location

Vomiting

Nausea

Fever

Constipation/ diarrhoea

PAST HISTORY:

H / o ht/dm/asthmatic/ tb

H / o previous abdominal surgery

H / o similar illness in the past

FAMILY HISTORY:

TREATMENT HISTORY:

CLINICAL EXAMINATION:

GENERAL EXAMINATION:

Temp:

p.r:

BP:

SYSTEMIC EXAMINATION:

CVS

RS

PER ABDOMEN:

Soft/ distended

Rif tenderness : present/absent

rebound tenderness: present/absent

guarding/rigidity : present/absent

Bowel sounds : present/absent

CNS

CLINICAL DIAGNOSIS:

INVESTIGATIONS:

CBC:

Haemoglobin,

W.b.c count,

Differential count,

E.s.r,

Random blood sugar

Renal function test

Chest x-ray

Abdominal x-ray

Electrocardiogram

Bedside ultrasonogram findings:

Positive / negative

SURGERY DONE:

Histo pathological finding:

Positive / negative

Other radiological investigations if any,

STATISTICAL ANALYSIS:

The collected data of study were tabulated.

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of study were calculated. The association of the groups by fisher exact test.

We also selected a cohort of patients for whom radiologists also performed the ultrasonogram. Data documented and analysed. Kappa value computed to show the significance between surgeons and radiologists.

RESULTS & INTERPRETATION:

In our study, total number of patients enrolled after clinical diagnosis- 112 patients. Collected data were tabulated and interpreted.

Total number of male patients – 58

Total number of female patients– 54 in the ratio of 1.1: 1. (Male: female ratio).

The total number of patients less than 12 years of age – 30 accounting for 27% of total patients enrolled.

Mean age of patients – 24.7 years.

In the clinical history, total number of patients who had right upper quadrant pain as significant history was 108- accounting for about 96.4 % of patients.

Next significant history being

Nausea– 78 patients accounting for about 69.6 %.

Other symptoms include

Vomiting – 48.2 %

Fever - 39.2 %

Anorexia – accounting for 33.9 %

Periumblical pain – 35.7 %

In our study, signs of appendicitis were elicited

mc.burney's tenderness – 104 (92.8%)

Temperature > 38*c - 30 (26.7 %).

Other signs were rebound tenderness, localised guarding / rigidity.

This lead us to conclude that, history of right lower quadrant pain is the significant positive history.

Sign of mc.burney's tenderness being the significant elicited sign in diagnosing acute appendicitis.

TABLE 1: CLINICAL FEATURES IN POPULATION GROUP

SEX :	
MALE	58(51%)
FEMALE	54(48%)
AGE:	
<12 YRS	30(27%)
>12 YRS	82(73%)
SYMPTOM	
RLQ PAIN	108(96.4%)
NAUSEA	78(69.6%)
VOMITING	54(48.2%)
FEVER	44(39.2%)
ANOREXIA	38(33.9%)
PERIUMBLICAL PAIN	40(35.7%)

SIGNS:	
MC BURNEY' TENDERNESS	104(93.8%)
TEMPERATURE >38*C	
REBOUND TENDERNESS	30(26.7%)
LOCALISED GUARDING/RIGIDITY	MINOR GROUP OF PATIENTS
OTHER SIGNS	

The table plotted above shows the history – symptoms and clinical examination findings. It also shows the number patients in our study for whom the symptoms and signs were elicited with its percentage mentioned.

TABLE 2: 2*2 TABLE – WITH ULTRASONOGRAM AND HISTOPATHOLOGY TABULATED.

HISTOPATHOLOGY

ULTRASONOGRAM BY SURGEONS	POSITIVE	NEGATIVE
POSITIVE	81	4
NEGATIVE	5	22

TOTAL NUMBER OF PATIENTS - 112

Surgeon performed ultrasonogram yielded signs of appendicitis – 85

Both ultrasonogram & histopathology positive in - 81

Total histopathological positive case - 86

Histopathology positive/ ultrasonogram negative - 5

Both histopathology & ultrasonogram negative - 22

Ultrasonogram positive / histopathology negative - 4

The data analysed and results obtained showed the following,

SENSITIVITY - 81 / 86 – 94 %

SPECIFICITY - 22 / 27 - 81.4%

POSITIVE PREDICTIVE VALUE – 81 / 85 - 95.3 %

NEGATIVE PREDICTIVE VALUE- 22 / 26 - 84.6 %

ACCURACY OF TEST- 103 / 112 - 92 %.

The association between two groups is computed with Fisher exact test. The two tailed p value between surgeons ultrasonogram and histopathology is <0.0001. The association between groups is considered extremely statistically significant.

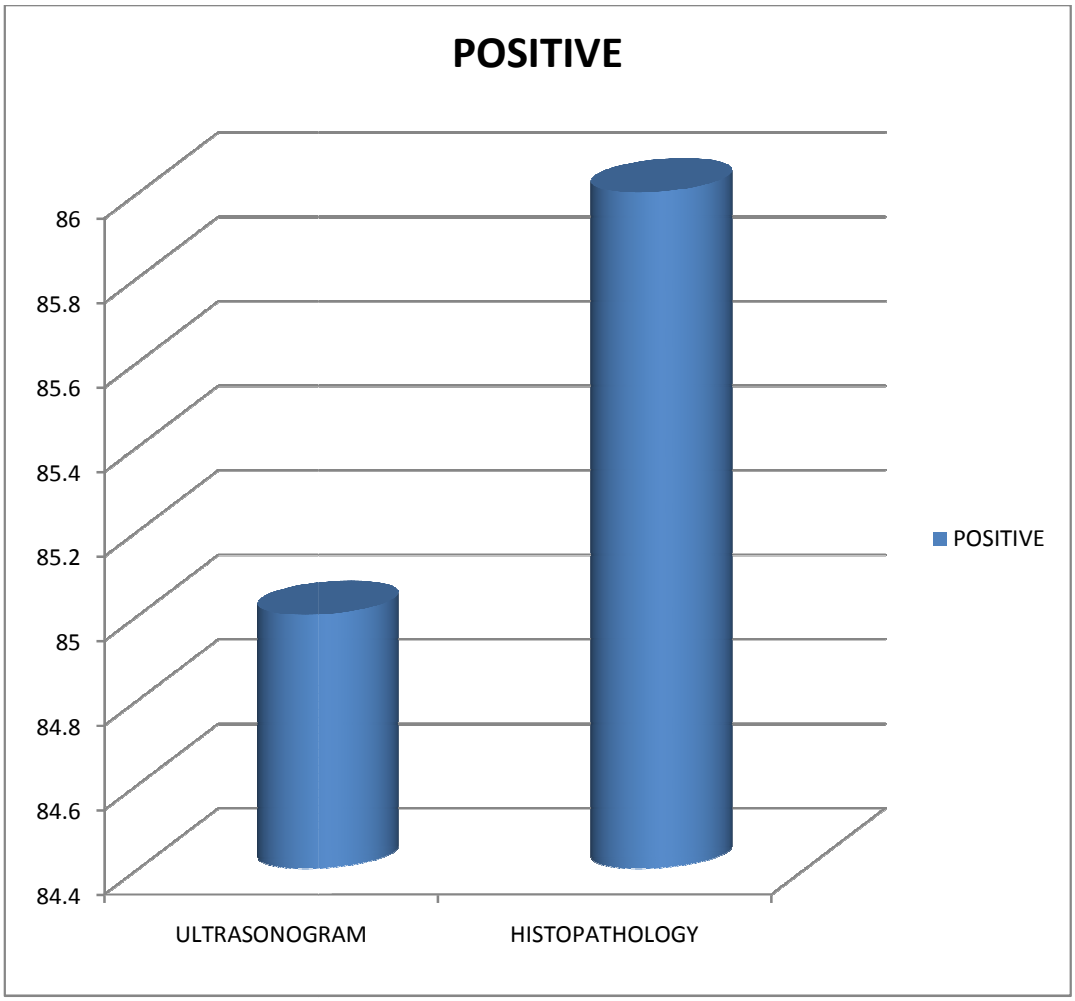
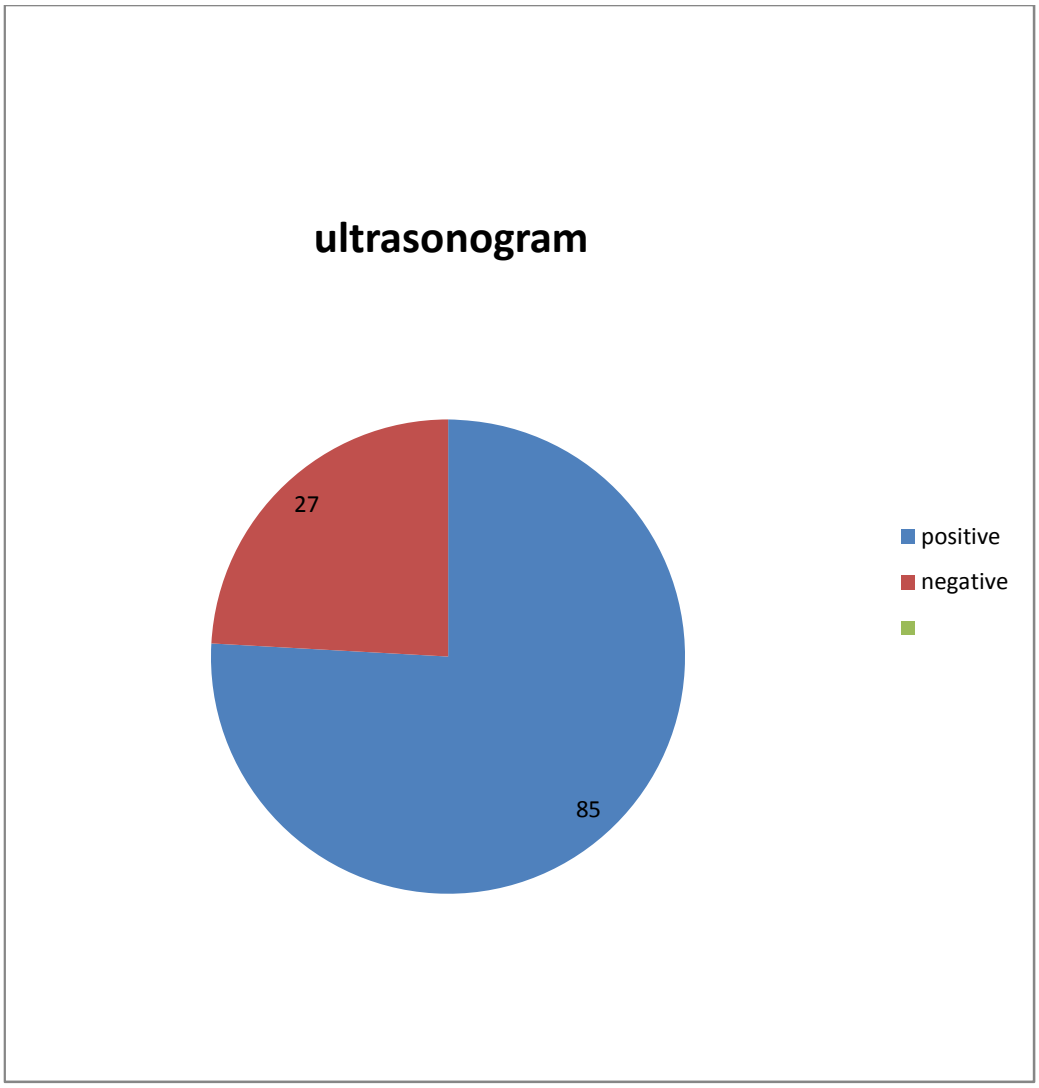


CHART 1:

Shows positive cases in ultrasonogram by surgeons and histopathological examination.

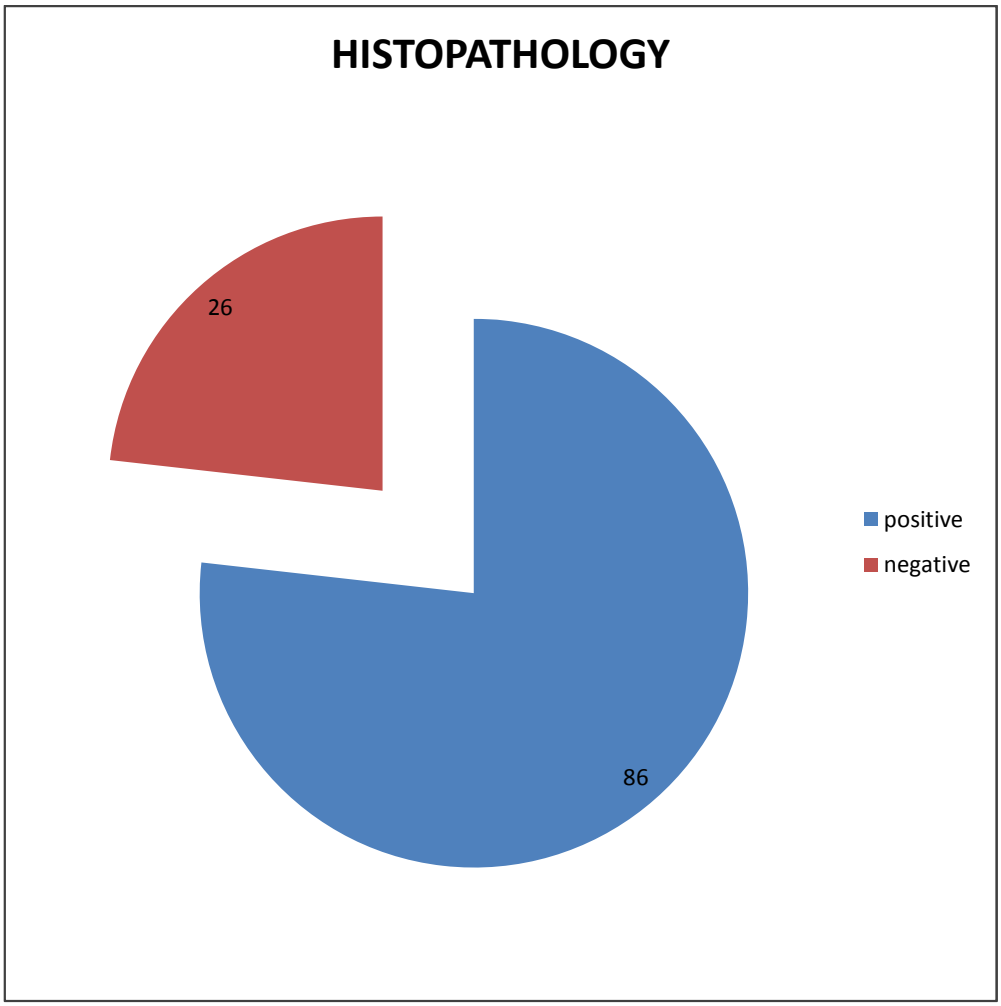


Pie chart 1: shows

Of the total 112 cases studied

Total number ultrasonogram positive – 85

Total number of negative cases - 27



PIE CHART 2: SHOWS

OF TOTAL 112 CASES –

HISTOPATHOLOGICAL POSITIVE CASES – 86

HISTOPATHOLOGICAL NEGATIVE CASES- 26

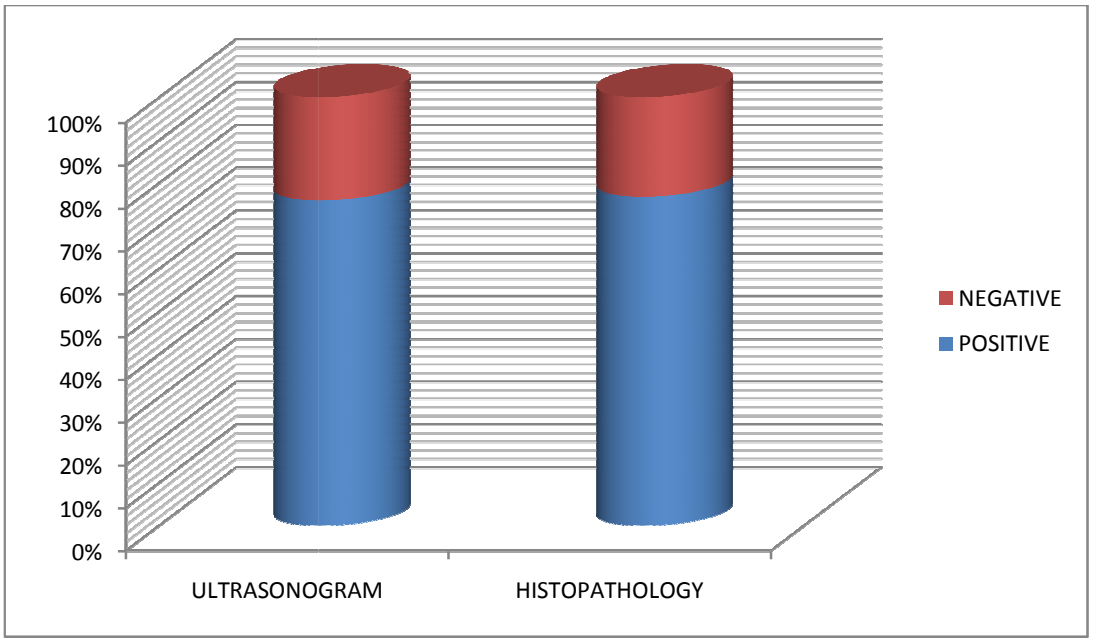


CHART 3: SHOWS

RELATION BETWEEN TOTAL CASES AND ULTRASONOGRAM & HISTOPATHOLOGICAL EXAMINATION.

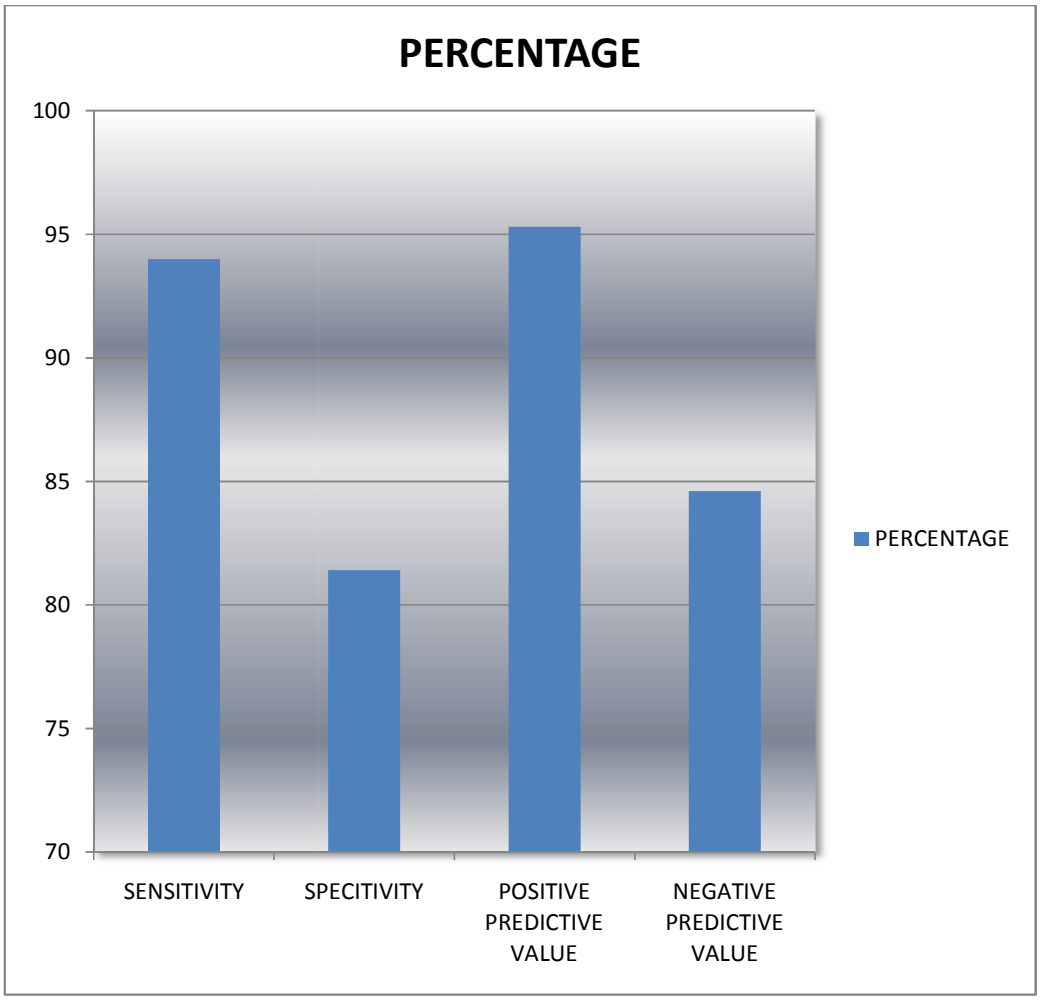


CHART 3: SHOWS

SENSITIVITY, SPECIFICITY, PREDICTIVE VALUE OF THE TEST.

Sensitivity – 94 %

Specificity – 81.4%

Positive predictive value – 95.3%

Negative predictive value– 84.6 %

Surgeon performed ultrasonogram yielded signs of appendicitis in 85 numbers of patients, of these 85 patients – histopathological signs were positive in 81 patients. Out of 85, 4 of them were negative in histopathological examination.

Surgeon performed ultrasonogram failed to diagnose acute appendicitis in 5 patients who showed positive findings in histopathological examination.

These shows,

Sensitivity value of about – 94 %

Positive predictive value - 95.3 %

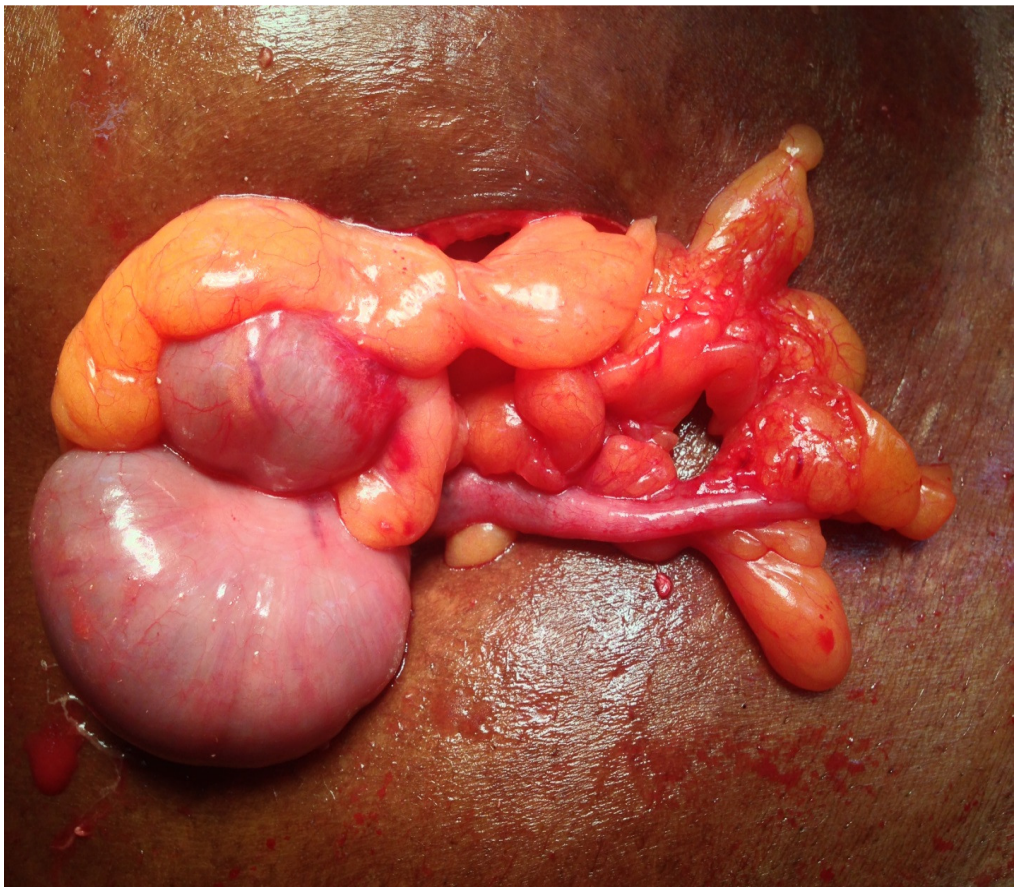
Of the patients who have been elicited with positive findings in ultrasonogram,

60 patients showed aperistaltic, non – compressible, blind ended, tubular, laminated wall with diameter greater than 6 mm.

14 of them elicited with Appendicolith

6 of them had peri-appendicecal / peri-cecal fluid collection

1 of them had inflamed peri-enteric fat alone.



A SIMPLE MASS APPENDIX SEPARATED FROM THE OMENTAL COVERING AND ADJACENT ILEUM AND CAECAL LOOPS

Intra operatively perforated appendix with abscess / phlegmon has been found in 12 patients who had positive ultrasonographic findings.

Surgeon performed ultrasonogram couldn't find radiological signs of appendicitis in 27 patients who were clinically positive for acute appendicitis.

Of those 27 patients, histopathological examination was also negative in 22 numbers of patients and 5 of those patients were positive in histopathological examination.

Thus, yielding

Specificity of about – 81.4 %

Negative predictive value – 84.6 %.

The accuracy of surgeon performing ultrasonogram yielded about 103/112 - 92 %.

The association between two groups is computed with Fisher exact test. The two tailed p value between surgeons ultrasonogram and histopathology is <0.0001. The association between groups is considered extremely statistically significant.

The results were again grouped as,

Sensitivity – 94 %

Specificity – 81.4%

Positive predictive value – 95.3%

Negative predictive value– 84.6 %

Accuracy - 92 %

The negative Appendicectomy rate based on clinical examination alone found to be 23 .2 % which is similar to literature.

On combining bedside ultrasonogram by surgeon who performs clinical examination as well as reduced the negative Appendicectomy rate & yields an accuracy of about 92 % .The association has shown statistically significant p value<0.0001.

A second analysis was performed, were there is a cohort of patients who have undergone bedside ultrasonogram by surgeons also underwent ultrasonogram by radiologist.

Patients who carried out ultrasonogram by both surgeon and radiologist were 35 in number.

By computing the data with histopathological findings, the results were analysed and tabulated.

Of these 35 patients,

24 of them had histopathological positive picture for acute appendicitis.

Radiologist performed ultrasonogram yielded positive finding in 22 patients.

Surgeon performed ultrasonogram yielded positive finding in 21 patients.

One patient which surgeon failed to yield positive finding in ultrasound, had positive finding in radiologist performed ultra sonogram as a non compressible, aperistaltic, blind ended tubular structure of diameter greater than 6mm with laminated gut wall which also yielded positive finding in histopathological examination.

Two of patients who were positive by histopathology have not been positively elicited by surgeon and radiologist performed ultrasonogram.

Eight patients were negative in both surgeon and radiologist ultrasonogram. They were also negative in histopathology.

Three patients who were positive in both surgeons and radiologist performed ultrasonogram, negative in histopathological examination of the specimen.

TABLE: HISTOPATHOLOGY

RADIOLOGIST PERFORMED ULTRASONOGRAM	POSITIVE	NEGATIVE
POSITIVE	22	3
NEGATIVE	2	8

TABLE SHOWS:

TOTAL NUMBER OF CASES - 35

RADIOLOGIST POSITIVE/ HITOPATHOGICAL POSITIVE -22

RADIOLOGIST POSITIVE/HISTOPATHOLOGY NEGATIVE -3

RADIOLOGIST NEGATIVE/HISTOPATHOLOGY POSITIVE – 2

BOTH NEGATIVE – 8

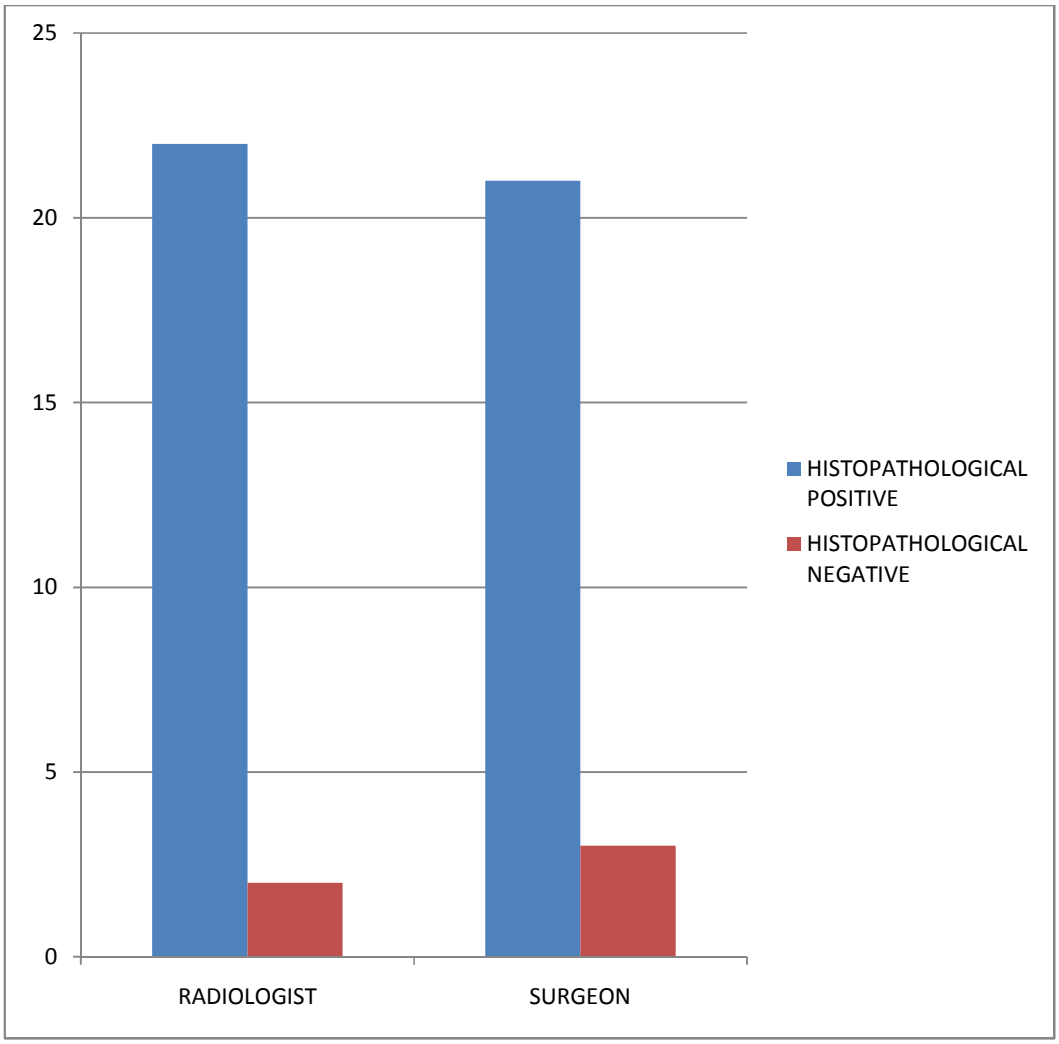


CHART SHOWS:

RADIOLOGIST AND SURGEONS FINDINGS WITH HISTOPATHOLOGICAL FINDINGS IN COHORT OF 35 PATIENTS.

TABLE: HISTOPATHOLOGY

SURGEON ULTRASOUND	POSITIVE	NEGATIVE
POSITIVE	21	3
NEGATIVE	3	8

THIS TABLE SHOWS

IN 35 PATIENTS WHO WERE IN COHORT – THEIR SURGEONS ULTRASONOGRAM FINDING WITH HISTOPATHOLOGICAL FINDING.

The accuracy of radiologist performed ultrasonogram yielded – 85.7 % (30/35).

The accuracy of surgeon performed ultrasonogram in cohort of 35 patients yielded – 82.8% (29/35).

By comparing these values, we had no statistical difference.

The kappa value for association was sort and it showed very good between groups. This signifies both are equally efficient in performing

ultrasonogram. It proves that surgeons trained can perform ultrasonogram accurately as others. The data tabulated and analysed

RADIOLOGY

	POSITIVE	NEGATIVE
SURGEONS		
POSITIVE	21	0
NEGATIVE	1	2

No of observed agreements –23 (95.83% of observations)

No of agreements by chance- 19.5(81.25% of observations)

Kappa value – 0.778

SE kappa- 0.212

95% confidence interval- 0.362 to 1.000

The strength of agreement is good.

The agreement between surgeon and radiologist is good implying ultrasonogram done by surgeon is as reliable as radiologist.

Our study was designed to assess the feasibility and accuracy of ultrasonogram by surgeons in our general population. Obtaining

accurate diagnosis by history and clinical examination would be challenging at times which then would need an additional imaging study.

Computed tomography studies, as they are readily available in emergency department being used commonly, but because of radiation induced malignancy (long term effect) is accumulated which has been published in several articles. Moreover computed tomography studies would use oral contrast which is unpalatable or ineffective as they would delay in diagnosis of patient with gastrointestinal symptoms.

Ultrasound examination has advantage of lack of radiation and cost effectiveness but present with their own set of disadvantages.

First being ultrasonogram studies have low sensitivity and specificity compared to computed tomography.

Second they rely on personnel from other department and they are also operator dependent, which has led to decreased sensitivity and specificity.

As the advantage shifts towards ultrasonogram, we the surgeons have unique opportunity for using it as a diagnostic tool. Residents are being trained in radiology department for emphasis in basics of radiology including ultrasonogram for a period of one month.

Thus as we surgeons continue to increase our experience in sonogram and will begin to perform ultrasonogram when initially evaluating a patient with clinical diagnosis of appendicitis.

Surgeon performed ultrasonogram at bed side of patient takes approximately 10 to 15 minutes and was performed on all 112 patients. In this study a single resident performed the study who had radiological training for a period of one month in our hospital.

The surgeon performed ultrasonogram with high degree of accuracy and confidence. The significance test showed p value<0.0001.The confidence is incredible to the fact the normal appendix is not visualised always and would learn to appreciate the negative predictive value of examination in combination with history and physical examination.

The study also compared in [a cohort of patients] the results of surgeons performing ultrasonogram with radiologists performing ultrasonogram [in a cohort of patients], of the 24 patients who had appendicitis surgeon visualised 21 of them and radiologist visualised 22 of them. These results showed argument is good between them (kappa value- 0.778).

The results might push towards the fact that surgeon can perform and use ultrasonogram- additive tool in acute appendicitis in bedside at

emergency department. We also have compared our study with other similar studies mentioned below which are comparable.

Surgeon performed ultrasound was carried out on all patients enrolled in our study. Appendicitis still primarily based on clinical diagnosis with history and clinical examination and not require further imaging studies.

Ultrasonogram would be useful in equivocal cases; further screening ultrasound by surgeons on all cases would improve accuracy in equivocal cases.

Our study demonstrated that a surgeon can perform ultrasonogram with high degree of accuracy. This suggests algorithm for evaluation of surgeon performing ultrasonogram in initial evaluation of patient is an acceptable, cost effective, easier and can be preferred method. It can avoid necessity of CT scan and complication rates.

LIMITATIONS:

SURGEONS' role in diagnosing the disease in pregnancy is not evaluated. In some of the studies BMI is considered a significant factor which is not taken here. The obese abdomen the diagnostic accuracy not evaluated. In our study both diagnostic and supportive evidence in ultrasonogram were considered as positive findings.

RELATED ARTICLES:

The articles which emphasised on surgeon performed ultrasound were discussed here

1) Jeffrey M. Burford published a study in March 2011. They studied role of ultrasonogram by surgeon in appendicitis. They also studied to use it as a diagnostic tool. Imaging studies were carried out in order to aid in diagnosis. Computerised tomography and ultrasonogram were commonly performed. Ultrasonography is portable and can be performed at bedside.

By combining clinical evaluation and surgeon performing ultrasonogram the diagnostic accuracy can be increased. He performed a study based on clinical diagnosis of appendicitis and its role with ultrasonogram. The study was carried out by single surgical resident with clinical evaluation and ultrasonogram. Histopathological examination is the gold standard for final diagnosis. He conducted study in 54 patients.

Of his patients, 54% had appendicitis with accuracy of about 89%.

He compared two half of the study to assess the experience gained by study. Result showed increase in accuracy from 85 to 93 %.

He subjected a cohort of patients to undergo radiologist ultrasonogram. 21 patients had undergone both studies. Accuracy by radiologist was 81 % while that of surgeon was 90 %. He documented as statistically not significant (p value>.05).

He concluded the accuracy surgeon performing was similar to others. He also states that surgeon while doing both clinical and ultrasonogram exam diagnostic accuracy is increased.

With these study, surgeon performed ultrasonogram as a primary diagnostic tool in appendicitis limiting delay in diagnosis.

2. Impact of surgeon performed ultrasound on diagnosis of acute abdominal pain – lindelius- published in January 2008 – showed for patients with acute abdominal pain higher diagnostic accuracy can be achieved when surgeon uses ultrasound as complimentary diagnostic tool to standard examination. He concluded with the statement that the use of bedside ultrasonogram by surgeons should be considered in emergency department as additive diagnostic tool. He enrolled 800 patients with abdominal pain and randomised them to undergo or not to undergo surgeon performed ultrasonogram. The preliminary diagnosis made by the surgeon with or without ultrasound was compared with final diagnosis made by senior surgeons 6 – 8 weeks later. The

diagnostic accuracy was significantly higher in group examined with bedside ultrasound in emergency department (64.7%vs56.8%- pvalue = 0.027) and ultrasound was contributable in 2.9 %. Confirming diagnosis in 24.1% cases.

3. Other study – ultrasound scan by surgeon for patients with acute abdominal pain- a prospective study- florin Alleman, Paulo cassina – published 20 November 2003- evaluated the routine use of abdominal ultrasonography in patients admitted to surgical emergency unit with acute abdominal pain. In these study, 496 patients were enrolled (234/262 = m/f), mean age being 45 years. The patients were primarily evaluated, investigated and subjected to ultrasonogram by attending surgeon. The results - ultrasonogram improved the diagnostic rate from 70 to 83 %. The diagnostic accuracy for acute appendicitis improved from 92% to 98%.The sensitivity and specificity were 91% & 99%. For biliary disease- accuracy improved from 93 % to 99%.The sensitivity and specificity - 94 % and 99 %. He concluded that ultrasonogram should be part of routine investigation which has to be mastered and used by the surgeons.

CONCLUSION:

Acute appendicitis is the common surgical emergency with male to female ratio (1.1:1) in our population.

The accuracy of surgeon performing ultrasonogram has been documented and had shown higher degree of accuracy. Its association with the gold standard (histopathological examination) is statistically significant.

The comparability of radiologist and surgeon performed ultrasonogram in cohort of patients also yielded very good association(kappa- 0.778) implying that surgeon were accurate and effective in performing ultrasonogram.

Thus based on our study, bedside ultrasonography by attending surgeon at emergency department could be used as primary diagnostic tool in initial evaluation of patient along with clinical examination in cases of acute appendicitis.

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ANNEXURES

INSTITUTIONAL ETHICAL COMMITTEE,
STANLEY MEDICAL COLLEGE, CHENNAI-1

Title of the Work : A study on surgeon performing bedside ultrasonogram In acute appendicitis with histopathological correlation

Principal Investigator : Dr.D.Hariprasath

Designation : PG in M.S.(Gen.Sur)

Department : Department of General Surgery
Government Stanley Medical College,
Chennai-10

The request for an approval from the Institutional Ethical Committee (IEC) was considered on the IEC meeting held on 08.04.2013 at the Council Hall, Stanley Medical College, Chennai-1 at 2PM

The members of the Committee, the secretary and the Chairman are pleased to approve the proposed work mentioned above, submitted by the principal investigator.

The Principal investigator and their team are directed to adhere to the guidelines given below:

1. You should inform the IEC in case of changes in study procedure, site investigator investigation or guide or any other changes.
2. You should not deviate from the area of the work for which you applied for ethical clearance.
3. You should inform the IEC immediately, in case of any adverse events or serious adverse reaction.
4. You should abide to the rules and regulation of the institution(s).
5. You should complete the work within the specified period and if any extension of time is required, you should apply for permission again and do the work.
6. You should submit the summary of the work to the ethical committee on completion of the work.

MEMBER SECRETARY, 19/12/13
IEC, SMC, CHENNAI

தகவல் படிவம்

ஆய்வில் பங்கேற்கும் நோயாளியின் கடமைப் பொறுப்புகள்

உங்களை கவனித்துக் கொள்ளும் மருத்துவருடன் நீங்கள் முழுமையாக ஒத்துழைக்க வேண்டும் என்று உங்களைக் கேட்டுக் கொள்கிறோம். சிகிச்சையளிக்கும் மருத்துவர் அளிக்கும் அறிவுரைகளை பின்பற்ற வேண்டும் என்றும், என்னென்ன செய்ய வேண்டும், என்னென்ன செய்யக்கூடாது என்று உங்களிடம் கூறப்பட்டுள்ளவற்றிலிருந்து சற்றும் விலகக்கூடாது என்றும் நீங்கள் எதிர்பார்க்கப்படுகிறீர்கள்.

ஆய்வில் உங்கள் பங்கேற்பு மற்றும் உங்கள் உரிமைகள்

இந்த ஆய்வில் உங்கள் பங்கேற்பு தன்னிச்சையானது மற்றும் காரணங்கள் எதையும் கூறாமலேயே நீங்கள் இந்த ஆய்விலிருந்து எந்த ஒரு நேரத்திலும் விலகிக் கொள்ளலாம். எப்படியிருந்தாலும், உங்கள் உடல் நிலைக்கேற்ப உங்களுக்கு பொறுத்தமான சிகிச்சை அளிக்கப்படும். ஆய்வில் பங்கேற்க நீங்கள் மறுப்பதால், அடுத்து வரும் ஆராய்ச்சி ஆய்வுகளில் உங்கள் பங்கேற்பை மறுப்பது போன்ற எந்தவித அபராதமும் விதிக்கப்படாது. உங்களை கவனித்துக் கொள்ளும் மருத்துவருடன் முழுவமையாக ஒத்துழைக்க நீங்கள் சம்மதிக்க வேண்டும். எந்த ஒரு நேரத்திலும், நீங்கள் மோசமாக உணர்ந்தாலோ அல்லது வேறு ஏதேனும் உடல்நலக்குறைவு உண்டானாலோ, தயவு செய்து, உங்களை கவனித்து வரும் மருத்துவரிடம் உடனடியாக தெரிவிக்கவும். சிகிச்சை உங்களுக்குப் பொருத்தமாக இருக்காது என்று தோன்றினால் உடனடியாக நிறத்தப்படும். உங்கள் சம்மதம் இன்றியேகூட ஆய்வு நிறுத்தப்படுவது சாத்தியமே. ஆய்வின்பொழுது ஏதேனும் புதிய தகவல் தெரியவந்தால், அதைப்பற்றி உங்கள் மருத்துவர் உங்களுக்கு தெரிவிப்பார்.

ஆய்வில் பங்கேற்பவர்/சட்டபூர்வமாக
ஏற்கப்பட்ட நபர் கையொப்பம்
அல்லது
பெருவிரல் பதிவு

சுய ஒப்புதல் படிவம்

ஆய்வு செய்யப்படும் தலைப்பு

குடல்–வால் நோயிற்கு சிகிச்சை

ஆராய்ச்சி நிலையம் : பொது அறுவை சிகிச்சைப்பிரிவு
அரசு ஸ்டான்லி மருத்துவக் கல்லூரி,
சென்னை - 600 001.

பங்கு பெறுபவரின் எண் :

பங்கு பெறுபவரின்
பெயர் & விலாசம் :

எனக்கு குடல்வால் நோய் இருப்பதை மருத்துவர் மூலம் அறிந்து கொண்டேன். அதற்கு அறுவை சிகிச்சை செய்வதற்காக எக்ஸ்-ரே, இரத்த பரிசோதனை, மீயோலி (அல்ட்ராசவுண்டு) பரிசோதனை செய்ய வேண்டிய அவசியத்தை மருத்துவர் மூலம் அறிந்து கொண்டேன் அதற்கு முழு மனதுடன் சம்மதம் தெரிவிக்கிறேன்.

மேலும் மீயோலி முடிவுகளும், என்னுடைய அறுவை சிகிச்சையின் முடிவும் மற்றும் அதனுடைய திசுபரிசோதனை முடிவுகளையும் மருத்துவரும், மருத்துவமனையும் பயன்படுத்திக் கொள்ள முழு மனதுடன் சம்மதிக்கிறேன்.

இது தொடர்பாக விளக்கங்களையும் விளைவுகளையும் மருத்துவர் எனக்கு தெரிந்த மொழியில் விளக்கி கூறினார்.

பங்கு பெறுபவரின் கையொப்பம் ..... இடம் ..... தேதி .....

பெற்றோர்/கணவர்/மனைவி கையொப்பம்.....

ஆய்வாளரின் கையொப்பம் .....இடம் ..... தேதி .....

MASTER CHART

S.NO	NAME	AGE	SEX	USG FINDING	HISTOLOGICAL FINDING	RADIOLOGY FINDING
1	PRIYA	18	F	POSITIVE	POSITIVE	NEGATIVE
2	RAJA	32	M	NEGATIVE	POSITIVE	NEGATIVE
3	SURYA	9	M	POSITIVE	POSITIVE	-
4	LAKSHMI	32	F	NEGATIVE	NEGATIVE	-
5	GOVINTHARAJ	48	M	NEGATIVE	NEGATIVE	-
6	SUNDARAMMAl	60	F	POSITIVE	POSITIVE	POSITIVE
7	NAVEEN	6	M	POSITIVE	POSITIVE	POSITIVE
8	SARANYA	11	F	POSITIVE	POSITIVE	POSITIVE
9	GANESAN	30	M	POSITIVE	POSITIVE	-
10	NAZEEMA BEGAM	22	F	POSITIVE	POSITIVE	-
11	SELVI	18	F	POSITIVE	POSITIVE	-
12	SHARMILI	5	F	NEGATIVE	POSITIVE	-
13	MOHAMMED RAYIQUE	24	M	POSITIVE	NEGATIVE	POSITIVE
14	ELUMALAI	40	M	POSITIVE	POSITIVE	-
15	SHANTHI	36	F	POSITIVE	POSITIVE	POSITIVE
16	SHANKAR	42	M	POSITIVE	POSITIVE	POSITIVE
17	ANITHA	10	F	POSITIVE	POSITIVE	-
18	VELMURUGAN	31	M	POSITIVE	POSITIVE	-
19	ATHILAKSHIMI	24	F	POSITIVE	POSITIVE	-
20	MURUGAN	48	M	NEGATIVE	NEGATIVE	NEGATIVE
21	CHITRA	36	F	POSITIVE	POSITIVE	-
22	NARAYANAN	30	M	POSITIVE	POSITIVE	POSITIVE
23	MALLIGA	12	F	NEGATIVE	NEGATIVE	NEGATIVE
24	NAMITHA	28	F	POSITIVE	POSITIVE	-
25	POUNDUREGAN	44	M	POSITIVE	NEGATIVE	NEGATIVE
26	KAVYA	8	F	NEGATIVE	POSITIVE	POSITIVE
27	AARTHI	22	F	POSITIVE	POSITIVE	-
28	ABDHUL RAHUMAN	24	M	POSITIVE	POSITIVE	-
29	POONGODI	18	F	NEGATIVE	NEGATIVE	-
30	RANJITH	10	M	POSITIVE	POSITIVE	-
31	MANIKANDAN	17	M	POSITIVE	POSITIVE	POSITIVE
32	ASHOK	11	M	POSITIVE	POSITIVE	-
33	JANAKI	15	F	NEGATIVE	NEGATIVE	-
34	NAGARAJ	48	M	POSITIVE	POSITIVE	-
35	CHINNAPONNU	60	F	POSITIVE	POSITIVE	-

36	RAJESH	8	M	POSITIVE	POSITIVE	-
37	BABY	71	F	POSITIVE	POSITIVE	-
38	VENKATASAMY	40	M	NEGATIVE	NEGATIVE	NEGATIVE
39	AARIYA	7	M	POSITIVE	POSITIVE	-
40	POOMANI	26	F	POSITIVE	POSITIVE	-
41	AAROKIYA PONNAMAI	24	F	POSITIVE	POSITIVE	-
42	DINESH	17	M	NEGATIVE	NEGATIVE	-
43	HARIHARAN	10	M	POSITIVE	POSITIVE	-
44	SUKUMAR	20	M	POSITIVE	POSITIVE	POSITIVE
45	SHAKIRA BEGAM	9	F	POSITIVE	POSITIVE	-
46	AJAY	8	M	NEGATIVE	NEGATIVE	NEGATIVE
47	KALAIVANI	32	F	POSITIVE	POSITIVE	-
48	VINOTH	6	M	POSITIVE	POSITIVE	-
49	SINDHU	28	F	NEGATIVE	POSITIVE	NEGATIVE
50	NAVEEN	14	M	POSITIVE	POSITIVE	-
51	RAJESWARI	50	F	NEGATIVE	NEGATIVE	POSITIVE
52	KALAIVANI	34	F	POSITIVE	POSITIVE	-
53	KAIPELLI	10	M	POSITIVE	POSITIVE	-
54	SENTHIL	22	M	POSITIVE	POSITIVE	-
55	JAYANTHI	18	F	POSITIVE	POSITIVE	-
56	NITHIYA	11	F	POSITIVE	POSITIVE	-
57	SEVEZH	30	M	POSITIVE	POSITIVE	-
58	RAVI	20	M	NEGATIVE	NEGATIVE	-
59	SUGANYA	18	F	POSITIVE	NEGATIVE	POSITIVE
60	VIJAY	29	M	POSITIVE	POSITIVE	-
61	KALAIVANI	17	F	POSITIVE	POSITIVE	-
62	SRINIVASAN	21	M	POSITIVE	POSITIVE	-
63	FATHIMA	42	F	POSITIVE	POSITIVE	-
64	BALAJI	9	F	NEGATIVE	NEGATIVE	NEGATIVE
65	SUNDARI	38	F	POSITIVE	POSITIVE	-
66	RAMESH	17	M	POSITIVE	POSITIVE	-
67	SUGANTHI	29	F	NEGATIVE	NEGATIVE	-
68	MURUGAN	27	M	POSITIVE	POSITIVE	-
69	MAKI	40	F	POSITIVE	POSITIVE	-
70	RAJENDIRAN	36	M	POSITIVE	POSITIVE	POSITIVE
71	TRISHA	4	F	NEGATIVE	NEGATIVE	-

72	THANGSRASU	34	M	POSITIVE	POSITIVE	-
73	KERAVAN	8	M	POSITIVE	POSITIVE	-
74	KAVITHA	36	F	POSITIVE	POSITIVE	POSITIVE
75	THULASI	42	F	POSITIVE	POSITIVE	POSITIVE
76	KARTHICK	22	M	POSITIVE	POSITIVE	-
77	SAKTHI	24	F	NEGATIVE	NEGATIVE	-
78	RAGINI	7	F	POSITIVE	POSITIVE	POSITIVE
79	PRAVEEN KUMAR	26	M	POSITIVE	POSITIVE	-
80	SUDHA	19	F	POSITIVE	POSITIVE	POSITIVE
81	PALRAJ	16	M	POSITIVE	POSITIVE	-
82	MALARKODI	34	F	NEGATIVE	NEGATIVE	-
83	BALRAJ	10	M	POSITIVE	POSITIVE	-
84	VAISHANEVI	28	F	POSITIVE	POSITIVE	POSITIVE
85	BALAMURUGAN	21	M	NEGATIVE	POSITIVE	-
86	SINDHU	12	F	POSITIVE	POSITIVE	-
87	MARAGATHAM	34	F	POSITIVE	POSITIVE	-
88	VELU	41	M	NEGATIVE	NEGATIVE	-
89	MADHU	7	F	POSITIVE	POSITIVE	-
90	RAJI	32	F	POSITIVE	POSITIVE	-
91	SELVI	38	F	POSITIVE	POSITIVE	POSITIVE
92	KAVI	43	M	POSITIVE	POSITIVE	-
93	BANU	42	F	POSITIVE	POSITIVE	-
94	RAHUL	6	M	NEGATIVE	NEGATIVE	-
95	MADHAVAN	17	M	POSITIVE	POSITIVE	POSITIVE
96	SARAVANAN	32	M	NEGATIVE	NEGATIVE	-
97	MANIKAM	10	F	POSITIVE	POSITIVE	POSITIVE
98	JOSEPH	24	M	POSITIVE	POSITIVE	POSITIVE
99	ELAVARASI	26	F	NEGATIVE	NEGATIVE	-
100	SIVAKUMAR	8	M	POSITIVE	POSITIVE	-
101	MUTHUKAMAR	17	M	POSITIVE	POSITIVE	POSITIVE
102	RAJESWARI	19	F	POSITIVE	POSITIVE	-
103	DINESH	6	M	NEGATIVE	NEGATIVE	-
104	VENGATESAN	34	M	POSITIVE	POSITIVE	-
105	INTHARANI	32	F	POSITIVE	POSITIVE	POSITIVE
106	BABU	18	M	NEGATIVE	NEGATIVE	-
107	THANGAMMAL	48	F	POSITIVE	POSITIVE	-

108	ARUN	7	M	POSITIVE	POSITIVE	POSITIVE
109	SAHUL HASEED	50	M	POSITIVE	POSITIVE	-
110	ANBARASAN	28	M	NEGATIVE	NEGATIVE	-
111	JEYA	30	F	POSITIVE	POSITIVE	-
112	RANGANATHAN	28	M	POSITIVE	POSITIVE	-